Harvard School of Public Health

Official Register of Harvard University

1989

1990

Harvard School of Public Health

Official Register of Harvard University

1989

1990

Digitized by the Internet Archive
in 2012 with funding from
Open Knowledge Commons and Harvard Medical School

http://archive.org/details/catalog19891990harv

■ A NOTE FROM THE DEAN

Public health is concerned with preserving and enhancing the health of populations. The scope of public health is extensive, as reflected in the range of courses, departments, centers, programs, and facilities described in this *Register.* The interests and expertise of faculty at the school are similarly diverse, extending across biological sciences, social sciences, numeric disciplines, and more.

This *Register* contains a wealth of information about educational opportunities at the School of Public Health. Though we have endeavored to make it accurate and comprehensive, it is necessarily an incomplete description of the learning experience available at the school. The School of Public Health is a place to acquire new skills; a place to enrich one's professional perspective by interacting with fellow students as well as with faculty; a place to gain a more sophisticated understanding of health sciences, health issues, and problems and their possible solutions; a place to test one's ideals, objectives, and imagination against the imposing array of biological, individual, organizational, economic, and political barriers to improved public health.

The principal educational mission of the school is to prepare leaders in professional service and research aimed at promoting the health of populations. We believe we are engaged in a vital enterprise of central importance to society. We welcome those who join us at the school to share in that sense of excitement and challenge.

Harvey V. Fineberg

■ TABLE OF CONTENTS

ACADEMIC CALENDAR 1

THE HARVARD SCHOOL OF PUBLIC HEALTH 2

DEGREE REQUIREMENTS 8
- The Master's Degrees 9
  - Master of Science 9
  - Master of Public Health 9
  - Master of Occupational Health 11
- The Doctoral Degrees 11
  - Doctor of Science 11
  - Doctor of Public Health 12

DEPARTMENTS AND LABORATORIES 13
- Behavioral Sciences 13
- Biostatistics 14
- Cancer Biology 16
- Environmental Science and Physiology 17
- Epidemiology 22
- Health Policy and Management 23
- Maternal and Child Health 27
- Nutrition 29
- Population Sciences 31
- Toxicology 32
- Tropical Public Health 33

DIVISION OF BIOLOGICAL SCIENCES 35

INTERNATIONAL HEALTH PROGRAMS 36
- Program for Professional Education in International Health 36
- Takemi Program in International Health 37
- Commission on Health Research for Development 38
- International Research Network on AIDS and Reproductive Health 38
- India-Harvard Exchange in Health Policy and Management 39
- Health Transition Program 39
- Harvard Institute for International Development 39
- Center for Population Studies 39

POSTDOCTORAL AND SPECIAL PROGRAMS 40
- Interdisciplinary Programs in Health 40
- Program in Human Ecology 41
- Program in Clinical Effectiveness 41
- Public Health for Lawyers 42
- Public Health for Dentists 42
- Community Health Improvement Program 43

CENTERS AND OFFICES 44
- Center for Health Communication 44
- Educational Resource Center for Occupational Safety and Health 45

continued

Kresge Center for Environmental Health 46
Injury Prevention Center 46
Office of Continuing Education 47

ADMISSION AND REGISTRATION 48

EXPENSES AND FINANCIAL AID 53

COURSES OF INSTRUCTION 59
Interdepartmental 59
Behavioral Sciences 61
Biostatistics 62
Cancer Biology 65
Division of Biological Sciences 66
Environmental Science and Physiology 66
Epidemiology 70
Health Policy and Management 72
Maternal and Child Health 77
Nutrition 78
Population Sciences 80
Toxicology 82
Tropical Public Health 82

ADMINISTRATION AND MEMBERS OF THE FACULTY 84

Volume 11, Number 9
September 5, 1989

Official Register of Harvard University

The *Official Register of Harvard University* (ISSN #0199-1787) is published thirteen times a year, four times in July, four times in August, and once each in September, November, January, February, and March. The *Official Register of Harvard University* is published by the Office of the University Publisher, 219 Western Avenue, Allston, MA 02134. Second class postage paid at Boston, MA.

POSTMASTER: Send address changes to *Official Register of Harvard University*, Harvard School of Public Health, Admissions Office, 677 Huntington Avenue, Boston, Massachusetts 02115. Requests for additional copies should be made directly to the Harvard School of Public Health at this address.

Every effort is made to ensure the information contained in this *Register* is accurate at the time of publication. However, the School of Public Health reserves the right to make changes without notice in tuition and fees, admission and degree requirements, courses of instruction, and other information contained herein.

In accordance with Harvard University policy, the School of Public Health does not discriminate against any person on the basis of race, color, sex, sexual orientation, religion, age, national or ethnic origin, political beliefs, veteran status, or handicap in admission to, access to, treatment in, or employment in its programs and activities. The following person has been designated to handle inquiries regarding the nondiscrimination programs: Ann R. Oliver, Associate Dean for Academic Administration, 677 Huntington Avenue, Boston, MA 02115; telephone 617-732-1069. In addition, inquiries regarding the application of nondiscrimination policies regarding race, color, national origin, age, sex, or handicap may be referred to the Regional Director, Office for Civil Rights, U.S. Department of Education, J.W. McCormack POCH, Room 222, Post Office Square, Boston, MA 02109.

Chapter 151c, Section 2B, of the General Laws of Massachusetts Any student in an educational or vocational training institution, other than a religious or denominational educational or vocational training institution, who is unable, because of his religious beliefs, to attend classes or to participate in any examination, study, or work requirement on a particular day shall be excused from any such examination or study or work requirement, and shall be provided with an opportunity to make up such examination, study, or work requirement which he may have missed because of such absence on any particular day; provided, however, that such makeup examination or work shall not create an unreasonable burden upon such school. No fees of any kind shall be charged by the institution for making available to the said student such opportunity. No adverse or prejudicial effects shall result to any student because of his availing himself of the provisions of this section.

The Harvard School of Public Health is accredited by the Council on Education for Public Health.

PHOTO CREDITS
Ed Malitsky (cover); Barbara Steiner (pp. 1, 6, 37); Joe Wrinn (p. 2); Christopher Morrow (pp. 3, 80); Bradford F. Herzog (pp. 4, 8, 11, 15, 48, 52, 55, 60, 69); Peggy McMahon (p. 5); Diane Shar (pp. 7, 43); Bill Truslow (p. 16); Paula M. Lerner (pp. 19, 73); Sharon Bray (pp. 24, 32); Martha Stewart (pp. 30, 39, 63); Joe McNally (p. 34); David Bradley (p. 45); Georgia Litwak (p. 66); Michael Lutch (p. 84).

ACADEMIC CALENDAR 1989–90

ORIENTATION—FALL 1989

August

28, Monday through September 8, Friday	Advance Seminar Program for new international students. Optional for US MPH students.

September

11, Monday	Orientation for all students. Optional registration for new students.
12, Tuesday	Registration, in person, for all students.
13, Wednesday	Department and program meetings.
14, Thursday and 15, Friday	Faculty advisers available to meet with students. Last day to register without late registration fee.

FALL SEMESTER—1989

September

18, Monday	First period "a" and "ab" courses begin.

October

2, Monday	Last day to register with late fee for fall semester.
9, Monday	Columbus Day, a holiday.

November

9, Thursday	First period "a" courses end.
10, Friday	Veterans Day, a holiday.
13, Monday	Second period "b" courses begin.
23, Thursday through November 26, Sunday	Thanksgiving recess.

December

20, Wednesday through January 2, Tuesday	Recess.

January

15, Monday	Martin Luther King, Jr.'s Birthday, a holiday.
19, Friday	Last day to pre-register for spring semester. Second period "ab" and "b" courses end.
22, Monday through January 26, Friday	Supervised special studies or field observations ("e" period).

Dean Harvey Fineberg and Harvard University President Derek Bok greet MPH students Wanda Barfield and Milan Moore at the reception following orientation lectures.

SPRING SEMESTER—1990

January

29, Monday	Registration, in person, for new students. Third period "c" and "cd" courses begin.

February

9, Friday	Last day to register with late fee for spring semester.
19, Monday	Washington's Birthday, a holiday

March

23, Friday	Third period "c" courses end.
24, Saturday through April 1, Sunday	Spring recess.
26, Monday through March 30, Friday	Supervised special studies or field observations ("f" period).

April

2, Monday	Fourth period "d" courses begin.

May

25, Friday	Fourth period "cd" and "d" courses end.
28, Monday	Memorial Day, a holiday.
29, Tuesday through June 1, Friday	Postclass period.

June

7, Thursday	Commencement.

■ THE PROFESSION

Public health is concerned with preserving and enhancing the health of populations. In the past, public health professionals—including physicians, managers, analysts, and scientists—have been instrumental in eradicating smallpox, developing a vaccine for polio, making progress toward the prevention of tropical diseases and the cure for sexually transmitted diseases, laying the foundation for the study of nutritional deficiencies and their corrections, establishing the field of industrial hygiene, applying statistical methods to the management of diseases, and using behavioral science in the reduction of self-imposed risks.

In the area of preserving and enhancing health, what is the distinction between medicine and public health? Unlike medicine, a well-established profession with a sharp public image, public health has multiple professional identities and a more diffuse image. This diverse group includes biostatisticians and epidemiologists, health administrators and educators, nutritional biochemists and cancer biologists, specialists in environmental and occupational health, and experts in behavioral and population sciences. In general, as a personal physician aims to maintain the health and to diagnose and treat diseases in an individual, the goal of the public health professional is to understand and meet the health needs of communities, groups, and nations. Where medicine follows a personal service ethic, conditioned by an awareness of social responsibilities, public health is governed by an ethic of public service, tempered by concern for the individual.

Some of the problems facing public health today include chemical and other hazards in the environment, the threat of new diseases such as AIDS, choices of lifestyle that rob millions of many healthy years, inappropriate use of medical technology, widespread inadequacy of health insurance and lack of access to the necessities of life, and the great parasitic diseases that kill and handicap millions around the globe. These represent challenges to which public health professionals continue to devote their energy and expertise.

■ THE SCHOOL

The Harvard School of Public Health seeks to educate scholars who will understand and help to ameliorate the health problems of society, to promote research that addresses these problems, and to train students to become leaders, advisers, and professional specialists sensitive to the needs of their communities.

The school's research aims to expand knowledge in health sciences by uncovering the fundamental mechanisms of disease and other causes of ill health in populations, and to improve the allocation of health resources by designing better health interventions, by improving the management of health institutions and systems, and by assisting in the development of health policy. In education, the school's overall goals are to prepare leadership in health, both national and international, for the twenty-first century, to serve the needs for continuing education in the health industry, and to increase public awareness and knowledge about health.

The school's research and teaching activities focus primarily on three areas of societal concern: health promotion and disease prevention, health policy and management, and international health, which combines and applies the first two areas in a broader setting. The programs in health promotion and disease prevention seek to increase our understanding of the factors that produce illness or impair health

Dr. Myron Essex, Professor of Microbiology and an internationally recognized leader in AIDS research, chairs Harvard University's new AIDS Institute.

and to develop methods of preventing or reversing them. Health policy and management attempts to bring sound analytic and decision-making practices to bear upon the more than $350 billion health care industry. Both areas emphasize the training of professional scientists and administrators for positions in research, academe, regulatory agencies, and health service institutions, and the advancement of basic scientific research and its application to pressing public health problems. The school serves as a crossroads for international health, attracting health policy makers and public health professionals from dozens of countries.

The faculty includes nearly 200 members, drawn from a variety of disciplines spanning the natural sciences, social and managerial sciences, and numeric sciences.

Harvard School of Public Health buildings (center), with Harvard Medical School (left) and the Countway Library of Medicine (right).

HISTORY OF THE SCHOOL

Professional education in public health had been steadily expanding at Harvard University for more than two decades before the actual founding of the School of Public Health in 1922. Its gradual development was characterized by certain important steps, the first of which was the establishment, in 1909, of the Department of Preventive Medicine and Hygiene in the Medical School—the first such department in the United States. The first Doctor of Public Health degree was conferred in 1911, the same year the Department of Sanitary Engineering was established in the Graduate School of Engineering. In 1913, the Department of Tropical Medicine was organized in the Medical School, followed in 1918 by the Division of Industrial Hygiene.

Also in 1913, the Harvard-MIT School for Health Officers was formed under the joint management of Harvard University and the Massachusetts Institute of Technology. The School for Health Officers operated until the fall of 1922, when it was superseded by the Harvard School of Public Health, made possible by an endowment for this purpose from the Rockefeller Foundation.

During the early years of the school's operation, several of its departments functioned jointly with counterparts in the Medical School, sharing facilities, faculty, and budgets. In 1946, the school was separated administratively and financially from the Medical School and became an autonomous unit of Harvard University. It continues to cooperate with the Medical School in teaching and research, and has developed close associations with other divisions of the university, particularly the Graduate School of Arts and Sciences, the John F. Kennedy School of Government, and the Graduate School of Business Administration.

The school also maintains a close association with a wide variety of health, medical care, and welfare organizations in Massachusetts and elsewhere. The facilities of hospitals and other institutions located near the school are available to qualified students. Other local, national, and international health facilities provide opportunities for observation and special studies, and members of their staffs assist in the school's educational program. The State Laboratory Institute of the Massachusetts Department of Public Health allows qualified students to obtain experience in laboratory methods pertinent to public health.

RESOURCES

Location The school's main buildings for research, teaching, and administration are located in the heart of Boston's hospital district and Harvard University's medical campus. The facilities adjoin those of Harvard Medical School, School of Dental Medicine, and Countway Library of Medicine, and are near Children's Hospital Medical Center, Beth Israel Hospital, Brigham and Women's Hospital, and other Harvard-affiliated hospitals.

The school is also within walking distance of Boston's Museum of Fine Arts and Isabella Stewart Gardner Museum, as well as Northeastern University and other colleges.

Public transportation to other parts of Boston is readily available. A shuttle bus, free to those affiliated with the school, runs frequently between the medical area, MIT, and Harvard's Cambridge campus.

Cross-Registration Students at the School of Public Health may enroll in courses offered by other Harvard schools, such as the Medical School, the Graduate School of Arts and Sciences, the John F. Kennedy School of Government, and the Graduate School of Business Administration. Many graduate courses at MIT and at the Fletcher School of Law and Diplomacy at Tufts University are also open to students at the school. Students are generally granted credit toward their degree for such courses, with the exception of courses in foreign languages. Students are welcome to enroll in foreign language courses on a noncredit basis at the Graduate School of Arts and Sciences.

Tuition charges for cross-registered courses, including foreign language courses, are included in the School of Public Health tuition payment. Students who wish to take courses in English as a second language at Harvard's Division of Continuing Education must pay an additional tuition fee, ranging from $365 to $715 for a twelve-week session.

Libraries The library needs of the school are served principally by the Francis A. Countway Library of Medicine. The Countway combines the resources and services of the Harvard Medical Library and the Boston Medical Library, making it the largest medical or health-related library in the country. Its recorded holdings include more than 509,000 volumes and 4,800 periodicals. The Countway also owns an extensive collection of historical materials dating from the fifteenth century. Its History of Medicine Department provides modern facilities for the use of these books and other rarities.

In the Microcomputer Laboratory, a user assistant advises students working on a class project.

Students may borrow from the Harvard College Library in Cambridge and from the libraries of other Harvard schools. Messenger service is provided daily between the Harvard College Library, the Countway Library, and various other Harvard libraries. Some departments within the school also maintain libraries. The Boston Public Library, MIT libraries, and other libraries in the Boston area add to the total book and periodical resources available to students.

Health Sciences Computing Facility Computing and data processing resources are available to students through the Health Sciences Computing Facility (HSCF). HSCF programmers and analysts assist researchers and students in using computers to analyze data, to perform extensive numerical calculations, to format text, and to acquire, maintain, and process data bases.

HSCF offers computing for school courses and programs on a variety of equipment. An IBM mainframe, running OS/MVS, provides batch computing. PL/1 and Fortran 77 as well as SAS, SPSS, SPSSX, BMDP, and Loglin statistical packages are available on the IBM. The facility also operates a Digital VAX minicomputer running ULTRIX, an interactive, time-sharing operating system. Programming languages and software include C, Pascal, Fortran 77, Loglin (loglinear analysis), RS/1 (statistical analysis), Minitab (statistical analysis), N/I/Troff (text formatting), ig2 (graphics), GDVS and IDES (data management), and BIBLIO (bibliographic data management).

Students may access the mini- and mainframe computers through terminals located on the fifth floor of the Kresge Building and on the twelfth floor of Building 1, as well as through personal computers. There is a fee for some HSCF services, and students should determine if they will be charged for computing before using the equipment.

HSCF maintains a tape library of data from the National Center for Health Statistics. Documentation and tapes are available for reference and copying.

HSCF offers a number of short courses, introductory and more advanced, in specific computer languages and packages. HSCF also provides consultation and advice for students for academically related data processing problems.

Microcomputer Laboratory Students and faculty may use the Microcomputer Laboratory's microcomputers and software for word processing, spreadsheets, file transfer, and basic statistical analysis. The laboratory is located in the Kresge Building and is open from 8 AM to 10 PM seven days a week during the academic year. User assistants are available, and a library of documentation provides information about software.

The Microcomputer Laboratory has 14 PCs Limited 286 microcomputers, 18 IBM PC/XTs, one IBM PC/AT, five Macintosh SEs, two Diablo letter-quality printers, one HP LaserJet+, one Apple LaserWriter, 23 dot-matrix printers, and four Image Writers.

Software support for the IBM-PCs and compatibles includes PC DOS, Lotus 1-2-3, WordPerfect, SAS, and Kermit 2.29 for file transfer and terminal emulation. Software for the MACs includes Microsoft Word, MacWrite, Cricket Graph, Excell, Hypercard, and MacKermit.

HEALTH PROMOTION TASK FORCE

A health promotion task force was established by the dean to identify ways that the Harvard School of Public Health could improve the health of its own population—students, faculty, and staff. The task force comprises six subcommittees which are looking into exercise, nutrition, the physical environment, smoking, alcohol and drug abuse, and stress. Some of the recommendations of this task force that have been implemented include the school's no-smoking policy and the Center for Health Promotion.

No-Smoking Policy As a part of the campaign for better health, the school has established a no-smoking policy. Smoking is currently permitted in very limited areas, and smokers are encouraged to attend smoking cessation classes.

Center for Health Promotion Within the Department of Behavioral Sciences, a center has been established to coordinate worksite health promotional activities and to encourage faculty members involved in health promotional research to commit resources and efforts to make the school an exemplary workplace for students, faculty, and staff. Health education, nutrition awareness, exercise promotion, and the establishment of a drug-free workplace have been some of the actions to date.

■ THE STUDENTS

The student body includes 530 full- and part-time students from throughout the United States and from more than forty other countries. In terms of occupational background, approximately 28 percent are physicians; also present in significant numbers are health services administrators, epidemiologists, nurses, dentists, lawyers, statisticians, environmental scientists, research assistants, psychologists, and social workers. One-third of the students are enrolled in doctoral programs.

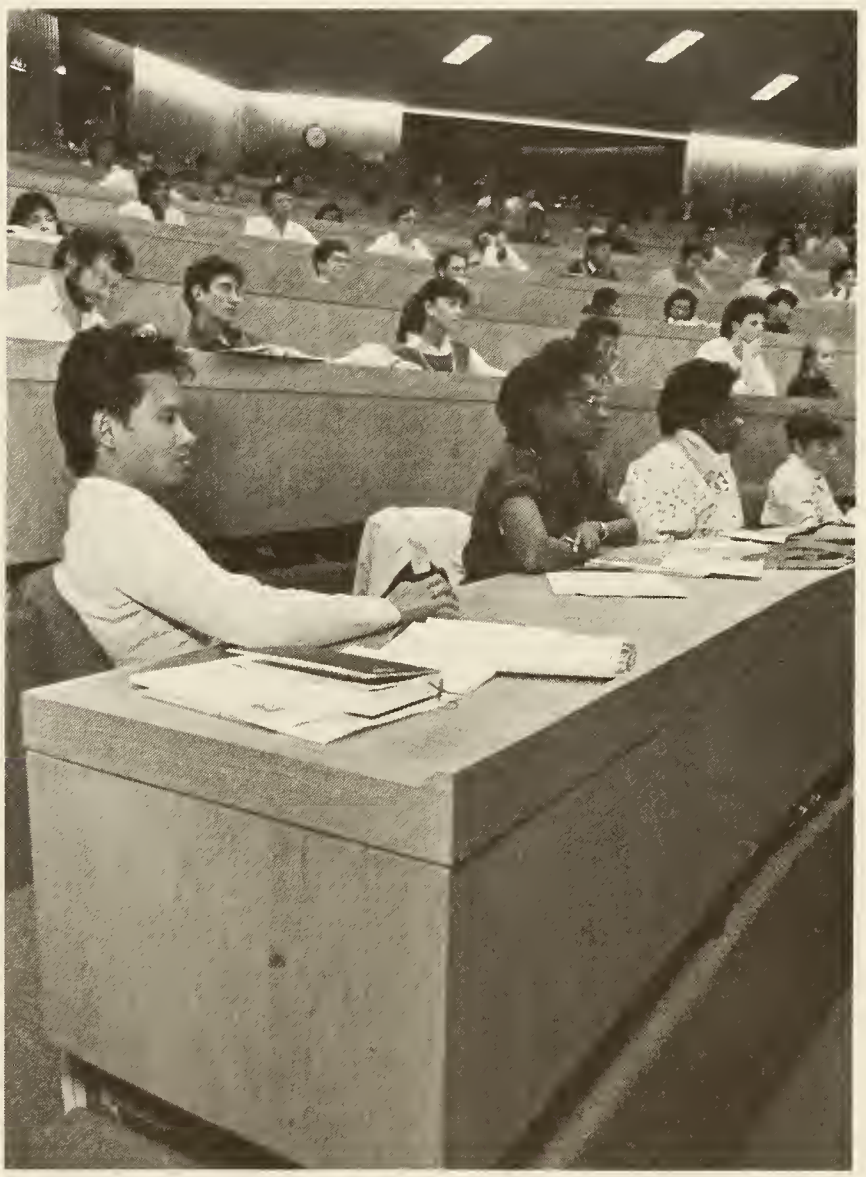
MINORITY STUDENTS

Members of minority groups at the school have joined to form the Committee for the Underrepresented. This group meets throughout the academic year to plan special symposia and panel discussions on public health issues concerning undeserved populations.

The Third World Caucus (TWC) implements programs and addresses issues that have an impact upon minority students at Harvard Medical School, School of Dental Medicine, and School of Public Health. It comprises four Harvard medical area student health organizations: Black Health Organization, Boricua Health Organization, National Chicano Health Organization, and Native American Health Organization.

Each fall, the school sponsors a reception to introduce minority students to minority alumni from the Boston area.

The school is eager to increase its enrollment of minority students and urges minorities to apply.



The John C. Snyder Auditorium is the setting for core courses in biostatistics and epidemiology, as well as for special lectures and forums on a wide variety of public health issues.

INTERNATIONAL STUDENTS

More than one-fourth of the students at the Harvard School of Public Health come from outside the United States. The experience they bring with them lends an important dimension to the international health components of the school's academic programs and adds to the diversity of the student population.

Students from abroad are invited to participate in the Host Family Program, administered by the Harvard International Office. This program provides students with the opportunity to get to know an American family who will welcome them and ease their transition to the American way of life.

The Harvard International Office also operates a furniture exchange during the summer and fall to provide low-cost secondhand furniture to students and scholars newly arriving from abroad.

For more information about either the Host Family Program or the furniture exchange, contact the Harvard International Office, 1350 Massachusetts Avenue, Cambridge, MA 02138 (telephone 617-495-3349).

HOUSING

The Henry Lee Shattuck International House is an apartment residence operated on a nonprofit basis by the school for its full-time students and their families from the United States and abroad. Located within walking distance of the school, Shattuck House consists of 72 apartments, each with a kitchenette and bath. All apartments are furnished with basic items except for linens, blankets, and kitchen utensils; no unfurnished units are available.

Since the demand far exceeds the number of apartments available, applications for Shattuck House should be submitted as soon as possible. **Prospective students may apply before they are accepted for admission to the school.** For application forms and more detailed information, contact Carol O'Connell, Office of Student Affairs, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1034).

The Office of Student Affairs also maintains a card file of available private housing and a list of local real estate agencies.

The Harvard University Housing Office in Cambridge administers housing in other university-owned complexes. Information and application forms may be obtained by writing to the Harvard University Housing Office, 7 Holyoke Street, Cambridge, MA 02138, or by calling 617-495-5239 (out of state: 1-800-252-5020). Students must enclose a copy of their letter of acceptance from the school with their housing application. The Housing Office also maintains listings of apartments and houses not owned by the university. These listings must be viewed in person; information is not given out by mail or telephone.

CHILD CARE FACILITIES

There are a number of child care facilities in the Harvard medical area and on the Cambridge campus. They are quickly filled, so arrangements should be made as early as possible. For further information, contact the Office of the Child Care Advisor at 617-732-1489 or 617-495-2851. The Medical Center Office for Parenting at 617-732-1615 can also provide information on support services, resources, and programs.

CAREER SERVICES

The Office of Professional Development provides an individualized program of career counseling which complements the efforts of departments, programs, and faculty advisers. Students may come to the office for help in assessing skills and goals, exploring career options, writing resumes and cover letters, and developing interviewing skills. The school's career counselor conducts numerous workshops covering various aspects of the job search and invites public health professionals to participate in panels where they share information about career paths and opportunities in their areas of expertise.

At Career Day '89, doctoral student Valerie Stone (right) learns about the Health Care Financing Administration from program officer Marva Nathan, SM '83.

1989 graduates proceed to the courtyard for Commencement ceremonies.

Early in 1989 the school held its first annual Career Day, which drew a number of potential employers representing private and nonprofit institutions, international organizations, and government agencies at the federal and state levels. This event gives students the chance to learn about the organizations, develop contacts, and submit resumes.

In the Career Resource Center, students have access to listings of current job openings (permanent, summer, and part time), information about fellowships and internships, and files on many health care organizations. A semi-monthly *Job Opportunities Bulletin* is distributed to all students and is available by subscription to alumni.

For more information about career services, please contact Andrea Wolf, Assistant Director of Professional Development, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1036).

ALUMNI ASSOCIATION

The Alumni Association of the Harvard School of Public Health enjoys an active membership of 4,800 graduates worldwide. The association is governed by a council of twelve members, which meets each spring and again during the fall meeting of the American Public Health Association (APHA). Alumni also meet regionally in major cities in this country and abroad. These smaller gatherings are organized by members of the association and the council with assistance from the school. Reunions have been held in Boston, Chicago, Los Angeles, New York City, and Washington, DC, and in Scandinavia, Japan, and West Berlin.

In 1981, the Alumni Association was instrumental in establishing the Alumni Annual Fund for Student Assistance to help provide tuition scholarships, travel grants, and funding for other student needs.

Members of the Alumni Association have also formed a network for the purpose of providing information to potential applicants to the school. A list of contacts is included at the end of this *Register.*

The school publishes the *Alumni Bulletin*, the official publication of the Alumni Association. The *Bulletin* reports on the diverse activities of alumni in many countries, and features articles and class news contributed by graduates.

For more information about alumni activities, please contact the Alumni Office, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115.

DEGREE REQUIREMENTS

The Harvard School of Public Health offers programs leading to the graduate degrees of *Master of Public Health* (MPH), *Doctor of Public Health* (DrPH), *Master of Occupational Health* (MOH), *Master of Science* (SM) in a public health discipline, and *Doctor of Science* (SD) in a public health discipline.

In general, the master's degrees are viewed as terminal degrees for individuals who seek professional positions in public health. In a few departments, however, the SM is intended as preparation for doctoral study. The doctoral programs are designed for students with interests in the scientific basis of public health and preventive medicine who wish to pursue academic or research careers. The following sections outline the general degree requirements of each program.

Background of Applicants For all programs, the school's Committee on Admissions and Degrees considers applicants' academic ability, the relevance of their previous education and experience, and their overall qualifications for graduate professional education in public health, including those qualities of character which reflect upon the individual's suitability to be a public health professional. Applicants must also satisfy the department or program to which they are applying that their background is appropriate for specialization in the particular field. Applicants to doctoral programs must demonstrate the ability to undertake original research. The following sections describe the usual background of applicants to each program.

Most courses at the school require students to write papers, reports, and examinations; doctoral students must also complete a thesis. All programs require course work in quantitative areas. Students who are not confident of their writing and/or math ability are advised to brush up on these skills, taking refresher courses, if necessary, before coming to the school.

Students are normally required to submit written assignments in typed, rather than handwritten, form. Since it is expensive to hire a typist, it is useful for prospective students to have gained some typing skill before entering the school. It is also helpful for entering students to be familiar with basic wordprocessing and spreadsheet software such as WordPerfect and Lotus 1-2-3.

For more information Because specific prerequisites and degree requirements vary with the discipline or field of specialization, prospective applicants should consult the sections of this book which describe departmental and interdisciplinary degree programs. Some applicants are required to submit scores from the Graduate Record Examination (GRE) or from another standardized test; details about this requirement and other information about admissions procedures can be found in the section *Admission and Registration*. For any questions not answered in this *Official Register*, please write to Bernita L. Anderson, Director of Professional Development, at the Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115, or telephone her at 617-732-1036.

The small size of most elective classes at HSPH fosters a lively interaction between students and instructors.

■ THE MASTER'S DEGREES

MASTER OF SCIENCE

The Master of Science (SM) programs differ considerably from department to department, both in their overall goals and in their specific admission and degree requirements. An applicant may be admitted to an SM program in more than one discipline, if the program meets the requirements of both departments involved; in this case, the degree conferred specifies both fields. An applicant may be admitted to either a one-year or two-year program, as described below.

Background of Applicants Students in the SM programs come from a variety of backgrounds. Students in the one-year SM program generally hold doctoral degrees in medicine, dentistry, veterinary medicine, or in another field relevant to the department(s) to which admission is sought.

Applicants holding master's degrees may be considered for admission to one-year or two-year programs, depending upon their prior educational and professional background and upon the particular requirements of the program to which they wish to apply.

An applicant with a bachelor's degree is normally considered for admission to a two-year program. However, a few programs, such as those in Physical Sciences and Engineering (in the Department of Environmental Science and Physiology), consider certain applicants with bachelor's degrees for a one-year program. These applicants must have had adequate training in science and mathematics and normally at least two years of relevant professional experience in the field of specialization.

A year or more of appropriate graduate work occasionally enables a student to fulfill the requirements of certain two-year programs in one or one-and-a-half years.

Requirements for the Degree Students enrolled in a one-year program must successfully complete at least 40 credit units, and those in a two-year program, 80 credit units. Unless they can demonstrate equivalent preparation, candidates for the SM degree must fulfill basic requirements in biostatistics and epidemiology, as follows:

1. BIO 200ab, *Introduction to Statistical Methods* (5 units) **or** BIO 201ab, *Principles of Biostatistics* (5 units) **or** HPM-BIO 203b, 203c, 203d, *Statistical Methods for Health Policy and Management* (Module I, II, III) (2.5 units each period)
2. EPI 200a, *Introduction to Epidemiology* (2.5 units) **or** EPI 201a, *Principles of Epidemiology* (2.5 units)

Applicants to programs in the biological sciences who lack a background in medicine or biology are advised to take ESP 205ab, *Human Physiology*, or a course in general biology elsewhere. Beyond these minimal course requirements, each department may specify additional courses that are necessary to satisfy degree requirements in the particular area of specialization.

MASTER OF PUBLIC HEALTH

The program leading to the Master of Public Health (MPH) degree is designed to prepare health professionals for careers in public health practice. Through the core curriculum, the program provides an essential foundation in disciplines basic to public health. Through the choice of an area of concentration within the MPH Program, students pursue in depth one or more areas of particular relevance to their career goals. The MPH degree program may also serve as a required academic year for residency training in preventive medicine, aerospace medicine, and occupational medicine. The occupational medicine residency is described with the Department of Environmental Science and Physiology.

Background of Applicants MPH students come from all around the world, bringing to the program a wide variety of backgrounds and experiences. Most applicants to the MPH Program hold a doctoral degree in medicine, dentistry, or veterinary medicine. However, applicants with a doctoral degree in a related field, such as biology, behavioral sciences, other natural and social sciences, law, economics, and engineering, are also considered for admission. Consideration is given to applicants with a master's degree in a field closely related to public health, such as nursing or social work, who have a highly distinguished academic record and substantial relevant professional experience (usually at least three years in an administrative position of responsibility).

Requirements for the Degree MPH degree candidates normally complete the program in one academic year of full-time study at the school. A minimum of 40 credit units is required, but students are encouraged to take a total of 45 to 50 credit units. In some instances, with the approval of the Committee on Admissions and Degrees, a student may complete the program over a period of two academic years. In such a case, the student must take at least 15 units of the MPH core courses during the first year.

The MPH Program provides exposure, through core courses, to behavioral sciences, biostatistics, environmental sciences, epidemiology, and public health management. Additionally, students in each concentration take *The Practice of Public Health*, a

year-long, integrative course addressing the history of public health and issues relevant to the area of concentration. The configuration of required and recommended courses is determined by the respective Area of Concentration Committee. Generally, the required courses account for approximately one-half of the credit units taken.

Areas of Concentration It is required that all applicants to the MPH Program select an area of concentration. Within each area, it is possible to choose among various tracks providing appropriate content as well as flexibility. Each of the five areas of concentration listed below is governed by an interdisciplinary committee.

Health Care and Organizational Management prepares graduates to evaluate medical practices or to administer large health care institutions, primarily in the private sector where they will need to manage patient care services, assess quality of care and new technologies, understand financing and reimbursement systems, deal with malpractice and risk issues, and handle large systems of data.

Public Management and Community Health prepares graduates to administer public health services within the public sector, both in state and local health departments and in community primary care settings. Courses designed to develop management and financial skills focus on community epidemiology, needs assessment, negotiation and leadership, and government financial mechanisms including grants and contracts, legislative processes, large public systems of care such as maternal and child health, alcohol and drug programs, and health law.

International Health prepares students from developing nations and those who intend to work in developing nations for careers in government and international organizations or independently funded national organizations. This concentration will stress community health and management of small delivery systems; primary health care; establishing priorities in resource-poor areas; the training and utilization of health workers; population-based prevention strategies; health system development at regional and national levels; the politics of international health; and the general fields of population, nutrition, infectious diseases, and primary care.

Environmental and Occupational Health provides training in fields such as toxicology, epidemiology, and industrial hygiene and safety as well as legal and policy issues and environmental health management. Physicians taking this concentration satisfy the Board of Preventive Medicine requirement for didactic training in occupational medicine.

Quantitative Methods prepares students for professional careers—not academic research careers—that utilize a high level of quantitative skills including epidemiology, biostatistics, decision sciences, demography, and evaluation. These careers may be in agencies in the federal government, other governmental agencies, or large health care institutions.

Combined Degree Programs Students enrolled in an MD, DMD, DDS, or DVM program may apply for concurrent admission to the MPH program (or to an SM program, although this is less usual), provided that a combined program can be arranged that meets the approval of both the Committee on Admissions and Degrees and the institution from which the doctoral degree is being earned. Students usually apply in their second or third year of medical, dental, or veterinary school for enrollment in their third or fourth year. Requirements for the MPH degree are the same for students in the combined degree program as for all other MPH degree candidates. Students in this program receive the MPH upon successful completion of both degree programs and conferral of the doctoral degree.

Additional Degrees Some students choose to continue their studies at the school after completing the MPH degree. These students may apply for an SM or doctoral program in any of the departments which offer such programs. Students who choose the option of applying for a second degree after the MPH may want to consider a practicum/field placement during the summer between the two programs.

Master of Public Health Program Office *Director: Dr. Bernard Guyer.* The MPH Program is governed by the MPH Director and coordinators representing each of the concentrations. As a group, the MPH Coordinating Committee is responsible for curriculum development, setting the requirements for the MPH degree, and providing representation on the MPH Subcommittee of the Committee on Admissions and Degrees. The MPH Coordinating Committee meets regularly with an advisory group composed of students, school faculty, and administrators. The MPH Program Office, under the guidance of an Assistant Director, provides information and serves as a central resource for students and faculty.

For more information Applicants who wish to know more about the specific curriculum for each area of concentration may contact the MPH Program Office after November 1, 1989, to request a mailing. Please write to the MPH Program Office, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115, or call 617-735-0090.

MASTER OF OCCUPATIONAL HEALTH

The program leading to the degree Master of Occupational Health (MOH) is designed to train physicians in the public health disciplines relevant to preventing occupational disease and injury. This one-year degree program is usually taken as part of a two-year approved residency in occupational medicine. Additional information on the program can be found in the description of the Department of Environmental Science and Physiology.

Background of Applicants Candidates must be graduates of an approved school of medicine. Those from the United States should have completed an internship or residency of at least 12 months in a hospital approved by the American Medical Association.

Requirements for the Degree Candidates for the MOH degree spend one year in residence at the school and must complete a program of at least 40 credit units. All candidates take the courses listed below unless they can demonstrate equivalent preparation. The required courses comprise 32.5 credit units; additional courses may be selected from the curriculum approved for residencies in occupational medicine.

1. BIO 200ab, *Introduction to Statistical Methods* (5 units) **or** BIO 201ab, *Principles of Biostatistics* (5 units)
2. ESP 231cd, *Occupational Health Policy and Administration* (5 units)
3. ESP 232cd, *Introduction to Occupational Medicine* (2.5 units)
4. ESP 234cd, *Basic Problems in Occupational Health* (5 units)
5. ESP 251a, *Health Hazards of Manufacturing Processes* (2.5 units)
6. EPI 201a, *Principles of Epidemiology* (2.5 units)
7. EPI-ESP 215cd, *Case Studies in Environmental and Occupational Epidemiology* (2.5 units)
8. TOX-ESP 204ab, *Principles of Toxicology* (5 units)
9. ESP 243ab, *Ergonomics/Human Factors* (2.5 units) **or** ESP 241cd, *Occupational Safety* (2.5 units)

Not required, but strongly recommended: BIO 210cd, *The Analysis of Rates and Proportions* (5 units) **or** BIO 211cd, *Regression and Analysis of Variance in Experimental Research* (5 units).

Descriptions of each course appear in the section *Courses of Instruction*.

■ THE DOCTORAL DEGREES

DOCTOR OF SCIENCE

The Doctor of Science (SD) degree is granted upon successful completion of a program of independent and original research in one of the basic disciplines of public health and the presentation of this research in an acceptable thesis.

Because specific prerequisites and degree requirements vary with the discipline or field of specialization, prospective applicants should consult the sections of this book which describe departmental and interdisciplinary degree programs. They are also encouraged to contact the department or program to which admission is sought for more detailed information.

An applicant may be admitted to a doctoral program in more than one discipline, if the program meets the requirements of both departments involved.

Background of Applicants Applicants to the SD program must hold at least a bachelor's degree. In some instances, an applicant will be expected to complete the SM degree at the school before being granted admission to doctoral study, in which case the student will first be admitted to an SM program.

Nancy Sullivan, a graduate of the master's program in Environmental Health Management, is working toward a doctorate in the Division of Biological Sciences.

Requirements for the Degree Students enrolled in the SD program complete a minimum of two academic years of full-time study in residence at the school. However, it generally takes longer to complete the required work and to prepare an acceptable thesis. Residence requirements are fulfilled by payment of tuition (see *Expenses*) and by pursuit of an academic program approved by the department of concentration and by the Committee on Admissions and Degrees.

In addition to satisfying the residency requirements, doctoral students are required to complete a minimum of 40 credit units in graduate-level courses distributed over one major and two minor fields. Each minor field consists of at least 10 credit units in formal courses. Such requirements may be increased in cases where there has been a substantial shift in field or where the student has declared two major fields, or reduced in cases of prior relevant course work or experience. (However, the residency requirements described under *Expenses* must still be fulfilled.) Courses in the major and minor fields must be completed with grades of "A" or "B."

Unless equivalent preparation can be demonstrated, doctoral students must take one of the introductory epidemiology courses (EPI 200a or EPI 201a), as well as courses in biostatistics at an intermediate level (ordinarily BIO 210cd, *The Analysis of Rates and Proportions;* BIO 211cd, *Regression and Analysis of Variance in Experimental Research;* or DBS-BIO 207b, 207cd, *Statistical Methods in Biology*). Departments may stipulate specific course requirements and normally require written and/or oral examinations on the course work in the three fields.

Qualifying Examination By the end of the second year, students should be prepared to take the oral qualifying examination, which is intended to assess a student's potential to perform research in his or her chosen field. Since most doctoral research in the school requires a substantive knowledge of more than one discipline or field, the examining committee includes faculty from disciplines representing the minor fields as well as the major field. The examination includes questioning in these fields outside of the proposed research.

A research committee consisting of the student's adviser and other faculty members should be appointed within one month after the qualifying examination is passed. This committee guides the student's research through to completion, meeting with the student at least once every six months to discuss details of his or her progress.

Thesis An acceptable thesis must be submitted within five years of the date of registration as a doctoral candidate. Occasionally, upon approval of the student's research committee and of the Committee on Admission and Degrees, thesis work may be performed in nonresident status. The thesis consists of one or more manuscripts suitable for publication in a scientific medium appropriate to the candidate's field. A thesis is accepted only after a public presentation and discussion has been held, with the research committee in attendance.

The handbook *Guidelines for Doctoral Students* is distributed during fall registration. This guide outlines in greater detail the requirements and procedures of the doctoral programs.

DOCTOR OF PUBLIC HEALTH

Like the SD degree described above, the Doctor of Public Health (DrPH) is an advanced degree which is granted upon successful completion of an approved program of independent and original investigation in a special field of public health and the presentation of the results of this research in an acceptable thesis. Formal requirements for the DrPH are the same as those for the SD. The primary difference between the two programs lies in the background of the degree candidates.

Background of Applicants Most applicants for admission to the DrPH program hold a doctoral degree in medicine, dental medicine, or veterinary medicine. Depending on the intended field of specialization, consideration may also be given to a candidate who holds an advanced degree in one of the disciplines basic to public health. The applicant must also hold, or be in progress toward, the MPH degree, or its equivalent, from an approved institution.

■ DEPARTMENT OF BEHAVIORAL SCIENCES

Steven L. Gortmaker, Senior Lecturer on Sociology and Acting Chairman of the Department

Faculty Professor Pierce; Visiting Professor Earls; Associate Professor Cleary; Lecturers D. Walker and Wechsler

Adjunct Faculty Professor Mertens

The Department of Behavioral Sciences trains researchers, teachers, and professionals in the behavioral aspects of health and health services. Teaching and research focus on the areas of health promotion and education programs; influences of behavior on health and disease; behavioral pathologies, including mental illness and addiction to drugs and alcohol; behavioral aspects of health services, including psychosocial factors affecting the use of services and compliance with medical regimens, as well as the behavior of health professionals; mass communications and public health; and social science methodologies as applied to public health problems and the evaluation of health services and programs.

In addition to relevant elements of behavioral disciplines, students learn research skills and techniques of applying behavioral sciences to public health issues.

Activities of the Department Current areas of research include the following:

- Opiate addiction among street addicts, causes of relapse, and methods of improving drug user treatment programs; substance abuse in health professionals
- Alcohol and drug use among junior high school, high school, and college students, and programs to reduce such use
- Success of perinatal health programs in reducing infant mortality and morbidity in both rural and urban areas of the United States
- Long-term impact of secondary prevention programs for adolescent pregnant women and school-aged parents (conducted in seven community sites across the country)
- Relationships among social supports, the availability and use of community services, family organizations, and the management and functioning of children with chronic illness
- Evaluation of the success of worksite health promotion programs
- Evaluation of interventions to reduce risks of HIV infection
- Environmental, social, and behavioral influences on childhood and adolescent obesity, focusing on the impact of television viewing, exercise, and recent trends in the United States
- Reduction of mortality from coronary heart disease by altering the risk factors of elevated blood pressure, elevated blood cholesterol, and cigarette smoking (Multiple Risk Factor Intervention Trial [MRFIT])

Degree Programs
Master of Science in Behavioral Sciences
Doctor of Science
Doctor of Public Health

Master's candidates do course work in areas of health and behavior, health promotion and education, behavioral aspects of health services, and behavioral pathologies. Doctoral candidates develop expertise in the application of behavioral science approaches and methods to selected public health problems. Examples of recent student research include the self-help approach to drug treatment, smoking prevention, alcohol and drug use among college students, dietary tyrosine, stress, and coping with chronic illness, including HIV infection.

Background of Applicants Applicants with a bachelor's degree in a related behavioral sciences discipline are generally admitted to the two-year master's program. Applicants with a master's or a doctoral degree may complete the Master of Science degree in one year or can be admitted directly into the doctoral program.

Career Outlook Positions taken by recent graduates include director of research and evaluation for a pregnancy prevention program, faculty at public health and medical schools, developer of educational curricula and programs, and evaluators of health promotion activities at an HMO and major corporations.

■ DEPARTMENT OF BIOSTATISTICS

Marvin Zelen, Professor of Statistical Science and Chairman of the Department

Faculty Professors Lagakos, Laird, Pagano, Ware, and Weinstein; Associate Professors Anderson, H. Feldman, Gelber, Gelman, Greenes, D. Harrington, Larson, Lavori, Politser, Robins, Schoenfeld, and Tsiatis; Assistant Professors DeGruttola, Finkelstein, Gatsonis, Gray, Kalish, Kim, Lefkopoulou, Orav, Rotnitzky, L. Ryan, Smith, Waternaux, and Wypij; Lecturers Amato and Testa

Adjunct Faculty Associate Professor Mehta

The programs in the Department of Biostatistics prepare students to contribute to the theory and practice of statistical science as applied to health. The department's programs in methodological research and interdisciplinary collaborations provide many opportunities for student participation. The school and the department have computing facilities which support all the commonly used statistical packages.

The department sponsors semi-monthly working seminars to foster student and faculty interest in new research areas. The working seminar topics for the 1988–89 academic year were AIDS modeling, decision sciences, errors in variables, longitudinal analysis, meta analysis, statistical computing, and teratology.

The faculty includes leaders in the development of statistical methods for clinical trials and observational studies, studies on the environment, animal experiments, and longitudinal studies. Members of the department serve on a large number of national and international advisory committees.

An introductory course in biostatistics is required of all students at the school; many students take further courses in the department. The department offers courses at the elementary, intermediate, and advanced levels. Elementary courses assume little background in mathematics and are designed for a wide audience. They aim to develop facility in quantitative reasoning, a command of basic methodology, and a critical appreciation of good statistical practice in the health sciences. Intermediate courses are designed to develop methodological skills in specific areas of application, such as epidemiology, health policy, and experimental science. Advanced courses require a strong background in mathematics and are primarily intended for degree candidates in biostatistics.

Activities of the Department Current areas of research include the following:

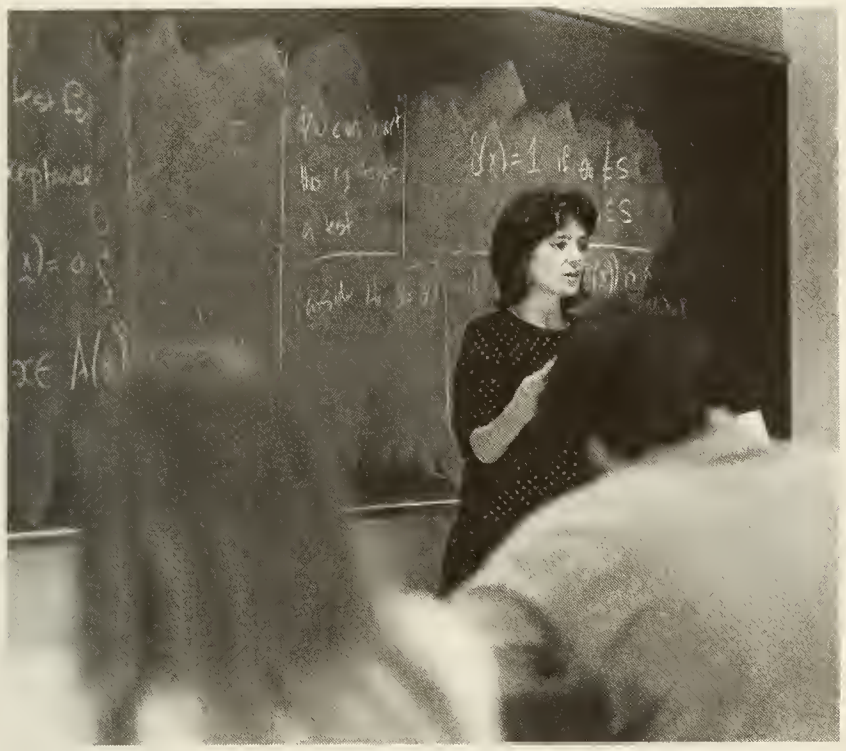
- Health effects of indoor and outdoor air pollution, carcinogenicity testing, community studies and environmental monitoring, carcinogenic and teratogenic effects of chemicals, meta analysis, and statistical aspects of the study of AIDS
- Research and development of statistical and computing methods for clinical trials, including sequential methods and survival models; environmental and epidemiologic research, including methods for longitudinal studies; analyses with incomplete data; and multiparameter estimation problems
- Statistical computing methods with emphasis on numerical algorithms, simulation techniques, epidemic and mathematical modeling, DNA modeling and manipulation, computer graphics, and use of microcomputers in clinical trials
- Collaborative clinical research in the treatment of cancer and AIDS in more than 250 national and international clinical trials
- Quantitative problems in health risk analysis, technology assessment, and clinical decision making, including new methods for assessing risks and benefits associated with environmental regulations; costs, risks, and benefits of clinical practices and medical technologies; and the impact of organizational structure on decision making
- International health projects based on the department's designation by the World Health Organization (WHO) as a Biostatistics Evaluation Center for Cancer
- Biomedical research consulting conducted through the Biostatistics Consulting Laboratory
- Collaborative research activities with biomedical scientists at the Harvard Medical School and affiliated hospitals

Degree Programs
Master of Science in Biostatistics
Doctor of Science
Doctor of Public Health

Areas of Concentration
Biostatistics
Clinical Biostatistics
Health Decision Sciences

CONCENTRATION IN BIOSTATISTICS

The main program in the department is biostatistics. Both the master's and the doctoral programs provide rigorous training and practical experience in statistical methods as they relate to the biomedical sciences. The primary emphasis of the department is doctoral training; course offerings reflect this orientation. The department offers a master's program mainly to prepare students for doctoral study, but qualified students can pursue the master's degree only.



Dr. Louise Ryan, Assistant Professor of Biostatistics, lectures in a class on statistical inference. Her research interests are in the theory and practice of clinical trials and teratology.

Required course work includes probability, statistical inference, statistical methodology, epidemiology, and computing; electives include advanced courses in biostatistics as well as courses in the biomedical sciences and health policy and management. Students are given experience in computing and have the opportunity to teach in the department's school-wide courses. They also develop consultative and data analytic skills through participation in the activities of the Biostatistics Consulting Laboratory.

At the end of their third semester, doctoral candidates are required to take a written qualifying examination and within the year make an oral presentation of research plans. Students who enter the doctoral program with a master's degree in biostatistics or statistics are encouraged to take the written qualifying examination in their first year of study. The doctoral thesis may include either original contributions to statistical methodology related to the health sciences or an innovative application to a field of public health or medicine.

CONCENTRATION IN CLINICAL BIOSTATISTICS

The Department of Biostatistics offers a special concentration for medical and public health professionals with specific interests in quantitative methods. The program in Clinical Biostatistics, which leads to the Master of Science degree, is aimed at medically qualified individuals with a strong quantitative background who are interested in pursuing careers in clinical investigation. This program offers training in the statistical methodology associated with clinical trials, epidemiologic studies, and related computing.

CONCENTRATION IN HEALTH DECISION SCIENCES

This program offers training in quantitative techniques in decision making at individual (clinical) and collective (policy) levels. In addition to core courses in probability and biostatistics, students take courses in decision analysis, cost-benefit and cost-effectiveness analysis, operations research, applied economics, behavioral decision theory, and computing. While methods are taught rigorously, applications to medicine, health care policy, and environmental risk analysis are emphasized. This is a joint program with the Department of Health Policy and Management; students may enroll in either department.

Background of Applicants Applicants to programs in Biostatistics and Health Decision Sciences should have strong preparation in mathematics and an interest in the health sciences. It is recommended that the mathematical preparation include at least one year of analysis past elementary calculus and linear algebra. Some knowledge of computing is helpful, but not essential, as the department provides opportunities for students to become familiar with modern computing through formal courses and consulting.

Students may enter the doctoral program directly or as a sequel to the master's program. Students entering the doctoral program as a sequel to the master's program are expected to take the written qualifying examination in the first year of the doctoral program. The path to the doctoral program depends on the student's level of preparation at the time of application. Students desiring a doctorate are encouraged to apply directly to the doctoral program. Doctoral applicants with insufficient preparation will be considered for the master's program.

Career Outlook The career outlook for biostatisticians is excellent. There are many more open positions than available candidates. The shortage of biostatisticians is expected to continue through this decade. Recent graduates have assumed faculty posts at universities and schools of public health and positions in research laboratories and centers in the federal government, in pharmaceutical companies, and in research institutes.

For more information Further information about the programs can be obtained by writing to the department chairman.

■ DEPARTMENT OF CANCER BIOLOGY

M.E. Essex, Professor of Microbiology and Chairman of the Department

Faculty Professors Cairns, Haseltine, and Little; Visiting Professor Trainin; Associate Professors Glimcher and Mullins; Assistant Professors Kanki, Kelsey, Lee, and Liber

The Department of Cancer Biology is primarily involved in research into the causes of cancer and offers training programs in basic and applied research leading to the Doctor of Science degree. Research activities are centered in the department's Laboratories of Carcinogenesis; Radiobiology; and Virology, Immunology, and Molecular Genetics.

Activities of the Department Current areas of research include the following:

- Precise changes in DNA sequences produced by the main categories of chemical carcinogens
- Mechanisms of mutagenesis and DNA repair
- Induction, mutation, and malignant transformation in mammalian cells by low and high LET radiations and by chemical agents
- Radiation-induced DNA damage and repair processes at the cellular and molecular levels
- Cytogenetic effects of radiation and chemical pollutants
- Effects of radiation in human diploid cells from cancer-prone patients
- Role of viruses in the cause of cancer, including hepatitis B virus and human liver cancer, and RNA tumor viruses as causes of leukemias, lymphomas, other tumors, and immunosuppressive disorders of animals and man; pathogenesis of AIDS and characterization of the family of retroviruses associated with this disease
- Tumor immunology, the molecular biology of cancer, gene regulation, and genetic events associated with the induction of leukemia and immunosuppressive disease

Degree Program
Doctor of Science

Areas of Concentration
Carcinogenesis
Radiobiology
Virology, Immunology, and Molecular Genetics

The program aims to develop the basic skills in laboratory techniques and data handling necessary for undertaking original research. For all areas of concentration, course work during the first one to two years emphasizes cancer biology, cellular and molecular biology, virology, immunology, radiation biology, and genetics. Additional courses are available in several areas of microbiology, in biochemistry, and in cell biology at the Harvard Medical School, at other Harvard schools, and at MIT. Students are encouraged to participate in the numerous seminar series and informal discussion groups offered in the Harvard Medical Area.

The program emphasizes publication of research results in the standard research literature. Most doctoral students in the department publish several papers before completing the degree. The latter part of the program involves intensive laboratory research under the guidance of a faculty adviser in the area of concentration.

Background of Applicants Consideration is given to applicants with a bachelor's degree in biochemistry, biology, or chemistry, as well as those with a clinical degree in medicine, dentistry, or veterinary medicine. Applicants should specify an area of interest. Personal interviews are encouraged.

Career Outlook Typical positions taken by recent graduates include postdoctoral research fellowships, junior faculty positions at academic institutions, and positions in independent research institutes, in governmental agencies, and in the biotechnical industry.

For more information To find out more about the department's activities and programs, contact Jacqueline Breen in the Department of Cancer Biology.

Researchers Richard Marlink, Phyllis Kanki, and Mauricio Hernandez are tracking the AIDS virus in Mexico.

■ DEPARTMENT OF ENVIRONMENTAL SCIENCE AND PHYSIOLOGY

Donald F. Hornig, Professor of Chemistry in Public Health and Chairman of the Department

Faculty Professors Brain, J. Harrington, Moeller, Monson, Speizer, and Spengler; Associate Professors Banzett, Burgess, Dennis, Drazen, Eisen, Evans, H. Feldman, Fredberg, Loring, Robins, and Valberg; Assistant Professors Christiani, Dockery, Kelsey, Kobzik, Koutrakis, Reid, P. B. Ryan, Shore, Warner, and Yanagisawa; Senior Lecturer Sherwood; Lecturers Rudnick, Shapiro, and Snook

Adjunct Faculty Associate Professors Amdur and Butler; Lecturer Cudworth

The Department of Environmental Science and Physiology is concerned with the detection and prevention of adverse health effects caused by chemical and physical factors in occupational and community settings. The problems are complex and require the insights of many specialties. The department's faculty, research staff, and students reflect the multidisciplinary nature of the field and include applied mathematicians, chemists, economists, engineers, epidemiologists, physicians, experimental psychologists, occupational health nurses, physiologists, and physicists.

Several of the programs offer financial support to qualified individuals on a competitive basis.

Activities of the Department Current areas of research include the following:

- Inhalation toxicology, comparative respiratory physiology, and deposition and clearance of particles in the respiratory tract
- Cell biology of the respiratory system, especially lung macrophages
- Acute and chronic epidemiologic studies of working and community populations exposed to various toxic materials
- Mechanical properties of lungs and chest wall, development of pulmonary function tests and testing equipment, and application of these methods to the study of respiratory disease in occupational and community environments
- Micromechanics of lung parenchyma, stereology, roles of surface and tissue stress bearing elements
- Design and evaluation of local exhaust systems and respiratory protection devices for the protection of workers
- Personal exposure assessment of gases and particles, evaluation of chemical composition of particles, nicotine and cotinine exposures, and modeling exposures
- Instrumentation for collection of particles and pollutant gases in industrial and environmental conditions; measurement of acid gases and particles
- Transport, transformation, and removal of environmental contaminants
- Airway physiology and pharmacology, asthma, chronic diseases of airways
- Statistical and methodological issues in the analysis of data from occupational and environmental health studies
- Analysis of approaches for efficiently collecting exposure information in support of environmental control decisions
- Risk assessment and evaluation for hazardous waste sites and energy sources
- Failures of air cleaning systems in nuclear power plants
- Control of naturally occurring radon and radon daughter products in homes
- Protecting the public in case of a nuclear accident
- International occupational health and safety

Degree Programs

Master of Science in Environmental Health Sciences
Master of Science in Physiology
Master of Occupational Health
Doctor of Science
Doctor of Public Health

Areas of Concentration

Occupational Health
- Industrial Hygiene and Occupational Safety
- Occupational Health Nursing
- Occupational Medicine
- Occupational Safety and Health

Physical Sciences and Engineering
- Air Pollution
- Environmental Health Management
- Industrial Hygiene and Occupational Safety
- Radiological Health (Radiation Protection)

Respiratory Biology
Respiratory Epidemiology

OCCUPATIONAL HEALTH

Richard R. Monson, Professor of Epidemiology and Director of the Educational Resource Center for Occupational Safety and Health

The training programs in occupational safety and health listed below are offered through the NIOSH-sponsored Educational Resource Center for Occupational Safety and Health at Harvard (see *Centers and Offices*).

Industrial Hygiene and Occupational Safety

The two-year Master of Science (SM) program in industrial hygiene and occupational safety is an integral component of the Educational Resource Center for Occupational Safety and Health. Admissions and curriculum are administered through the department's Physical Sciences and Engineering program unit, described further along in this section of the *Register*.

Occupational Health Nursing

A two-year educational program for the preparation of graduate nursing students at the master's level in occupational health and occupational health nursing is offered by the Educational Resource Center. The curriculum prepares students in the practice of occupational health nursing and in the basics of occupational health research, reflecting and promoting diversified and expanded roles in this specialty practice. Upon completion of degree requirements, a Master of Science in Physiology (Occupational Health) degree is awarded.

The program places major emphasis on identification of health hazards, workplace assessment, program planning and intervention, worker health promotion, and disease and injury prevention. The training includes courses in occupational health, industrial hygiene, epidemiology, biostatistics, toxicology, occupational health nursing, health behavior, administration, and policy. Industrial settings, clinics, hospital-based occupational health programs, and agencies serve as practicum placement sites. Research activities include pilot epidemiologic studies, collaborative projects, and surveillance activities culminating in a research paper.

Some financial support may be available for United States citizens or permanent residents through traineeships or scholarships. For more information, contact Mr. Daryl Bichel, Occupational Health Program, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1260).

Background of Applicants Applicants must have at least a bachelor's degree in nursing from a program accredited by the National League for Nursing and three years of nursing experience, preferably in occupational health nursing. Documents required for application include a goal statement, college transcripts, letters of recommendation from three persons, aptitude scores from the Graduate Record Examination (GRE), evidence of satisfactory completion of a basic statistics course, and registration to practice nursing in a state or territory.

Occupational Medicine

The one-year program in occupational medicine leads to either the Master of Occupational Health (MOH) or the Master of Public Health (MPH) degree. Physicians are trained in the public health disciplines relevant to the prevention and control of occupational disease and injury. The course work includes epidemiology, biostatistics, occupational medicine, toxicology, industrial hygiene, health policy, and administration.

The Harvard School of Public Health—University of Massachusetts Occupational Medicine Residency is fully accredited by the Accreditation Council for Graduate Medical Education to offer the didactic training outlined above and a practicum year leading to board eligibility in occupational medicine. Dr. David C. Christiani from Harvard is director of the residency and Dr. Jay S. Himmelstein from the University of Massachusetts is co-director.

Two practicum year tracks are available. The practicum year at the Harvard School of Public Health emphasizes the development of skills in clinical occupational medicine and occupational epidemiology. During this year, acquired knowledge and abilities are applied to patient management and workplace problem solving, and at least one short-term research project is designed, executed, and documented under faculty supervision. Field experience includes rotations through hospital-based occupational health clinics, the Massachusetts Division of Occupational Hygiene, and corporate medical departments. For more information, contact Mr. Daryl Bichel, Occupational Health Program, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1260).

The practicum year at the University of Massachusetts Medical Center emphasizes clinical occupational medicine, although research opportunities also exist. Clinical electives in relevant medical and surgical subspecialties are available, and skill development in consultation and workplace interventions is stressed. For further information, contact Dr. Jay Himmelstein, Occupa-

tional Health Program, Department of Family and Community Medicine, University of Massachusetts Medical Center, 55 Lake Avenue North, Worcester, MA 01685 (telephone 508-856-2734).

Some financial support for residency candidates who are United States citizens or permanent residents may be available through traineeships or National Research Service Awards.

Background of Applicants Physicians currently holding positions in the field of occupational safety and health who plan to return to these positions are considered particularly strong candidates for admission.

The two-year residency is open to candidates who have completed at least one year of clinical training in internal medicine or family practice; in addition, board eligibility or certification in a primary care specialty is preferred.

In addition to an application to the degree program, applicants should send a letter of interest to the Occupational Health Program at Harvard University, indicating their preferred site for the practicum year and enclosing a curriculum vitae listing medical training and experience, research experience, and publications. Admission to the practicum year of the residency is a separate process from admission to the degree program, but usually occurs shortly after admission to the degree program. Regardless of initial acceptance, continuation into the second year of the residency is contingent upon having had adequate prior clinical experience and exemplary performance in the didactic phase of the program. Applications for the degree program are reviewed and approved beginning in September for admission in September of the following year. Applicants who require early notification should indicate this in a cover letter accompanying the application forms.

Background of Applicants Applicants normally have a bachelor's degree and advanced training in science. Applicants currently holding positions in the field of occupational safety and health who plan to return to these positions are considered particularly strong candidates for admission. College-level organic and inorganic chemistry are required for admission.

Occupational Safety and Health

The Master of Science (SM) program in occupational safety and health emphasizes the epidemiologic and biostatistical aspects of occupational safety and health. This is generally a two-year degree program, although an individual with a PhD or JD degree may complete the program in one year. It is anticipated that persons without a doctoral degree will subsequently enroll in a doctoral program.

Some financial support may be available for United States citizens or permanent residents through traineeships or National Research Service Awards. For further information, contact Dr. James M. Robins, Department of Environmental Science and Physiology, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1260).

At the school's annual Poster Day, Dr. Theresa Sweeney, Research Associate in Respiratory Biology, describes current research on particle deposition to Assistant Professor Douglas Dockery.

PHYSICAL SCIENCES AND ENGINEERING

John D. Spengler, Professor of Environmental Health and Director of the Program in Physical Sciences and Engineering

This program unit emphasizes the chemical, physical, and engineering aspects of public and occupational exposures and of contaminant control technology. Master's and doctoral degree programs are offered in four areas of concentration: Air Pollution, Environmental Health Management, Industrial Hygiene and Occupational Safety, and Radiological Health (Radiation Protection).

Background of Applicants Physical Sciences and Engineering candidates normally have a bachelor's degree in engineering, chemistry, physics, mathematics, or biology. Preparation in the sciences ordinarily includes courses in differential and integral calculus, general and organic chemistry, and physics (mechanics).

The Master of Science (SM) degree is normally earned after two years. Applicants with advanced degrees or two years of relevant experience may request consideration for admission to a one-year SM program. Bachelor's degree holders with an extremely strong background in the sciences, with undergraduate preparation in subjects such as statistics, mammalian physiology, and microeconomics, may also be considered for admission to a one-year program. Applicants interested in this option may consult Dr. Joseph J. Harrington for further information (telephone 617-732-1163).

Doctoral degree applicants should contact Linda Fox in the Physical Sciences and Engineering Program Office (telephone 617-732-1170) to arrange for an interview with faculty in the program.

Air Pollution

The Master of Science (SM) and doctoral programs provide education in atmospheric chemistry, air monitoring, turbulence and diffusion, aerosol sciences, control technology, indoor air pollution, exposure assessment, and health effects of air pollutants. The curriculum also includes courses in toxicology, statistics, environmental law, and physiology. For more information, contact Dr. P. Barry Ryan, Department of Environmental Science and Physiology, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1167).

Environmental Health Management

The master's and doctoral programs in environmental health management are intended for students interested in quantitative approaches to the evaluation and management of the physical environment. Students complete courses in three areas: basic environmental sciences, data analysis and inference, and decision sciences.

Basic environmental science courses include exposure assessment, environmental chemistry, physiology, and environmental/industrial toxicology. Advanced courses in environmental science may have a wide scope or may be oriented toward a specific medium (such as air, surface water, or groundwater) or pollutant (such as ionizing radiation); they may focus on monitoring, modeling, or control of pollutants. Courses in data analysis and inference include basic biostatistics and epidemiology and more advanced topics such as multiple regression and analysis of variance. The required courses in decision sciences familiarize students with concepts and techniques from operations management, statistical decision analysis, and economics.

Courses in the three basic areas are supplemented by electives, such as environmental law, environmental and natural resource policy, environmental or regulatory economics, computer science, cancer biology, and health risk assessment. Some of these electives are offered at other Harvard schools or at MIT. Students particularly interested in hazardous waste management or groundwater contamination normally take about one-third of their courses outside the Harvard School of Public Health. Students are encouraged to participate in summer internships, although this is not a requirement. For more information, contact Dr. John S. Evans, Department of Environmental Science and Physiology, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1258).

Industrial Hygiene and Occupational Safety

The Master of Science (SM) and doctoral programs in industrial hygiene and occupational safety are designed to help meet the demand for professional personnel with the skills and scientific knowledge needed to identify and control health problems of the workplace. The core curriculum includes courses in exposure assessment, environmental chemistry, manufacturing processes, environmental control, safety and ergonomics, radiological health, toxicology, and epidemiology. Additional courses in risk assessment, policy and administration, and occupational/environmental law are available.

Students specializing in industrial hygiene normally undertake internships and research projects dealing with toxic substances, noise, radiation, and heat stress. Students graduating from the program have the skills required to handle the broad range of environmental hazards existing in the workplace. For more information, contact Dr. John S. Evans, Department of Environmental Science and Physiology, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1258).

Radiological Health (Radiation Protection)

The Master of Science (SM) and doctoral programs in this area are intended for individuals pursuing careers in radiation health physics. The fundamentals of radiation detection, consequences of environmental release, protection, and control are emphasized. The curriculum includes courses in radiation protection, radiation biology, instrumentation, dosimetry, and aerosol sciences. For more information, contact Dr. Dade W. Moeller, Office of Continuing Education, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115 (telephone 617-732-0793).

RESPIRATORY BIOLOGY

Joseph D. Brain, Cecil K. and Philip Drinker Professor of Environmental Physiology, Professor of Physiology, and Director of the Program in Respiratory Biology

This program offers doctoral training in preparation for research careers in respiratory biology. It is built on a public health viewpoint of the lung as a portal of entry and a target organ for environmental agents, and focuses on such aspects as respiratory mechanics, control of breathing, airway pharmacology, and respiratory defense mechanisms, especially macrophage biology. The program also emphasizes inhalation toxicology and the pathology of environmental and occupational lung disease. The biology is broadly based, ranging from molecular and cell biology to integrated organismic, environmental, and comparative physiology; both normal and pathological physiology are included.

Intensive course work in the first two years may include physiology, biochemistry, cell and molecular biology, experimental pathology, engineering, toxicology, statistics, and immunology. The latter part of the program consists of research under the guidance of a faculty adviser. Collaborative research opportunities exist in several area institutions. Special facilities are available including three electron microscopes and a flow cytometer, as well as technologies developed by the program (magnetometric measurements of organelle motion and laser stereology).

Background of Applicants Candidates normally have a bachelor's degree in the physical sciences, or in biology with a strong physical science and mathematical component. The Master of Science (SM) degree is normally earned after two years, although students with prior master's degrees in related areas may earn the SM in one year. Candidates also frequently include veterinarians and physicians. Terminal master's degree programs are not ordinarily offered; students are expected to continue for the doctoral degree.

RESPIRATORY EPIDEMIOLOGY

Director of the Program to be Announced

This program offers training at both the master's and doctoral level in preparation for research careers in respiratory epidemiology. Major work at present is directed toward assessing the possible effects of sulfur oxides, nitrogen dioxide, ozone, particulate matter, acid aerosols, and other pollutants on health. This has involved both adults and children, and airborne material both indoors and outdoors. The research has been planned as a longitudinal study (about to enter its fifteenth year), so that a considerable data base has been developed for both aerometrics and health data. Health effects are being assessed by standard questionnaires and simple tests of pulmonary function.

Background of Applicants Candidates are generally doctoral students or postdoctoral trainees with qualifications in medicine or biostatistics.

Career Outlook Some positions taken by recent graduates of the various programs offered by the Department of Environmental Science and Physiology include industrial hygienist with the US Department of Labor, the state of Rhode Island, and the Aluminum Company of America; assistant director, NIOSH; epidemiologist, United Auto Workers Union; coordinator of environmental quality, state of Oregon; environmental engineer and scientist in government and industry; and assistant professor in schools of medicine, public health, and nursing.

■ DEPARTMENT OF EPIDEMIOLOGY

Dimitrios V. Trichopoulos, Professor of Epidemiology and Chairman of the Department

Faculty Professors Monson, Tsuang, and Willett; Associate Professors Cook, Mueller, Stampfer, and A. Walker; Assistant Professors Cattani, Hsieh, Hunter, Krolewski, and Maclure; Lecturer Murphy

Adjunct Faculty Professor Paffenbarger

Epidemiology is the study of the frequency and distribution of disease and of its determinants. The Department of Epidemiology offers training in the application of epidemiologic methods to the investigation of diseases of unknown cause. Areas of emphasis include malignant neoplasms, cardiovascular disorders, abnormalities of reproduction and development, mental disorders, and other major diseases for which preventive measures are still unknown or inadequate.

Activities of the Department Current areas of research include the following:

- Role of viruses in the etiology of cancer
- Relationship between thyroid disease treatment and breast cancer
- Relationship between exposure to chemicals in the workplace and the development of cancer
- Health effects of oral contraceptives
- Relationship of hormonal patterns and breast cancer
- Etiology of non-Hodgkin's lymphoma, with emphasis on immune system disturbances
- Relationship of diet and risk of cancer
- Factors in youth predisposing to chronic disease
- Case identification and risk factors in mental disorders

Degree Programs
Master of Science in Epidemiology
Doctor of Science
Doctor of Public Health

The master's program provides students with basic skills in epidemiologic and quantitative methods and in computing, in preparation for research careers. The one-year training program for the Master of Science (SM) degree is open to applicants with a medical degree or equivalent biological background. It includes most of the courses offered by the department, plus courses in principles of biostatistics, statistical methods in research, and computing principles and methods. Additional courses in areas of special interest and/or supervised research comprise the remainder of the program. The department has no master's program for students who do not have a medical degree or equivalent biological background.

The doctoral programs are designed for students who plan careers of research or teaching in epidemiology. Unless course work equivalent to that described for the SM degree has been taken previously, most of the first two years is occupied with courses. Subsequently, doctoral candidates complete a thesis and gain experience in teaching and research.

Background of Applicants Most candidates for the master's program are physicians, dentists. or veterinarians. The period of research training may be extended for qualified students by admission to either of the doctoral programs or to special student status.

The department considers applications for direct admission to the Doctor of Science (SD) program from candidates holding bachelor's degrees with strong backgrounds in biology and mathematics. For these individuals, the SD generally takes four to five years to complete; candidates with relevant doctoral degrees may complete the program in three years.

Career Outlook Some positions taken by recent graduates include officer in the Epidemic Intelligence Service, Centers for Disease Control; epidemiologists at the National Cancer Institute; and appointments at universities and medical schools in research and instruction.

■ DEPARTMENT OF HEALTH POLICY AND MANAGEMENT

Robert J. Blendon, Professor of Health Policy and Management and Chairman of the Department

Faculty Professors Curran, Fineberg, Frazier, Hedley-Whyte, Herzlinger, Hiatt, Hsiao, Newhouse, Roberts, and Weinstein; Visiting Professors Emerson and Pliskin; Associate Professors Epstein, Graham, Politser, Reich, and Shepard; Assistant Professors Calkins, Kane, Mollica, Mulley, Sapienza, and Thorpe; Lecturers Barrett, Braun, P. Feldman, Hemenway, Henn, and Palmer; Member of the Faculty Berwick

Adjunct Faculty Professors Field, Greenfield, and Leape; Associate Professor Gostin; Assistant Professors Gamble and Kaplan; Lecturers Gougeon, Kasten, Moseley, Moulton, Siegrist, and Vanderschmidt

The Department of Health Policy and Management is a mission-oriented department concerned with improving the health care delivery system and mitigating public health risks in both the United States and abroad. The department is dedicated to resolving major management and health policy problems through original research, advanced training, and dispute resolution. Priorities in the department are organized in six broad areas: health financing and insurance; management of health hazards; management of health care organizations; management and evaluation of medical technology; business and labor in health; and international health. The department's problem-solving orientation is exemplified by its strong ties with leading health practitioners in hospitals, HMOs, health advocacy groups, corporate medical departments, health and environmental consulting firms, state health departments, legislative committees, federal regulatory agencies, and international agencies. Practical problem-solving skills are emphasized by an interdisciplinary faculty that includes management specialists, decision analysts, accountants, physicians, lawyers, policy analysts, economists, political scientists, and program evaluators.

Activities of the Department Current areas of research include the following:

- **Health Financing and Insurance** Designing new systems for payment of physicians; predicting the responses of hospitals and physicians to reforms in the hospital reimbursement system; estimating the costs and benefits of increasing Medicaid coverage for uninsured poor; designing public policies to cope with medical malpractice, litigation, and rising insurance premiums
- **Management of Health Hazards** Comparing the effectiveness of alternative AIDS prevention policies (e.g., premarital screening, contact tracing); use of risk assessment to set priorities for environmental health protection; quantifying the health benefits of exercise; devising new approaches to enhancing highway safety; designing clinical and policy strategies to protect the health of underserved populations (e.g., refugee trauma in the United States)
- **Management of Health Care Organizations** Applying concepts of corporate strategic planning to the challenges faced by leaders of America's major health systems and pharmaceutical firms; measuring and enhancing the quality of medical care; using survey methods to track long-term trends in public confidence in physicians, hospitals, and other health care professionals
- **Medical Technology** Developing new analytic tools for technology assessment; performing meta-analyses of data from clinical trials; estimating cost-effectiveness models of new technologies for treatment of coronary heart disease
- **Business and Labor in Health** Comparing responses of business and labor to the AIDS epidemic; negotiating occupational health and safety as well as health care benefits in the collective bargaining process
- **International Health** Evaluating and determining the cost-effectiveness of health programs in developing countries (e.g., childhood vaccinations, oral rehydration therapy); analyzing means of financing health services (e.g., user fees, insurance, general tax revenues); research strategies to improve health conditions in developing countries; analyzing development policies and health

Degree Programs
Master of Science in Health Policy and Management
Doctor of Science
Doctor of Public Health

Dr. William Hsiao (third from left) and his team of researchers have developed a systematic method of determining rates for physicians' fees which is being considered for use by Medicare.

MASTER OF SCIENCE IN HEALTH POLICY AND MANAGEMENT (TWO-YEAR PROGRAM)

The two-year Master of Science (SM) program in Health Policy and Management is designed for students who are building professional careers in health-related fields and who aspire to leadership roles in either the public or private sector. The key elements of the program are an emphasis on professional skills and concepts, a solid grounding in the substance of health problems, rigorous quantitative training, and a curriculum which combines professional, academic, and clinical activities. The program is based on the premise that training in an academic setting should be enriched by experience in problem-solving situations and work in a health setting. The curriculum is applied to practical situations through a required summer internship program and an applied field research program.

Students in the two-year SM program are required to satisfy the requirements of at least one of the following five professional concentrations:

- **Health financing and insurance,** for students who are planning careers in the private or public sector where analytical skills in economics, accounting, and finance are critical to management or policy decisions. The required courses include financial analysis and control, economic theory, economics of the health sector, statistical methods, epidemiology, regulation/planning, and reimbursement systems. Examples of recommended electives include cost-benefit analysis of health programs, the role of government in the health care system, and business and labor in the health system.
- **Management of health hazards,** for students interested in careers devoted to preventing diseases and injuries through design of policies for organizations such as corporations, labor unions, public interest groups, public sector agencies, and legislative committees. The required courses include epidemiology, statistical methods, economic theory, quantitative policy analysis, management, and public health ethics. The menu of recommended electives permits students to develop specialties in specific health problems such as AIDS, environmental pollution, and injuries.
- **Management of health care organizations,** for students pursuing management careers within the rapidly growing health care delivery system, including both public and private sector institutions. The required courses include financial analysis and control, applied economic analysis, statistical methods, epidemiology, decision analysis, and strategic planning. Examples of recommended electives include operations management, management information systems, risk management, marketing, and assessing physician performance. This concentration has a strong focus on the planning and managing of health professionals in patient care settings.

- **International health,** for students with prior international experience and relevant foreign language skills who are interested in management or policy careers in developing countries or in organizations that work extensively abroad. The required courses include epidemiology, statistical methods, planning in developing countries, management, and economic analysis. Examples of recommended electives include infectious disease control, demography, and political economy. This concentration is linked to the broader International Health Programs in the school.
- **Health research and analysis,** for students looking toward doctoral education and research careers in areas such as health economics, quality of care, technology assessment, health decision sciences, and health program evaluation.

Students select one of these concentrations at the beginning of their first year of study in consultation with their faculty adviser. In keeping with the program's flexibility, second-year students are encouraged to enroll in courses relevant to their concentrations at the Harvard Graduate School of Business Administration, the John F. Kennedy School of Government, and the Medical School.

Background of Applicants The program seeks candidates from a wide variety of undergraduate fields whose personal characteristics, work experience, and academic record, particularly in quantitative and analytic course work, suggest outstanding potential in the areas of health policy and management. An aptitude test (GRE, GMAT, LSAT, MCAT, or DAT) is required. Applicants whose preparation appears deficient in some area, such as quantitative methods, may be offered provisional acceptance, contingent upon the successful completion of specific course work in advance of matriculation.

Candidates are expected to have several years of pertinent post-baccalaureate work experience in the health field, but exceptions are occasionally made for outstanding applicants. Deferred admission is available for some applicants who demonstrate strong potential in the field, but who lack sufficient professional experience in the health sector. Students offered deferred admission work within the health field, in a position approved by the program, for a minimum of one year before matriculating.

MASTER OF SCIENCE IN HEALTH POLICY AND MANAGEMENT (9-MONTH PROGRAM)

The nine-month Master of Science (SM) program in Health Policy and Management is designed primarily for physicians (and other candidates with relevant advanced degrees) who are research oriented and desire an intensive exposure to analytic and quantitative skills. The degree is appropriate for students interested in either domestic or international research questions. Graduating MPH students who have research interests or desire more advanced coursework are encouraged to remain for a second year and earn the SM degree in Health Policy and Management.

The required courses include biostatistics, epidemiology, economic theory, and decision analysis. The menu of recommended electives includes upper-level coursework in health economics, health decision sciences, and program evaluation. Students are also recommended to take upper-level courses in biostatistics and in epidemiology.

Background of Applicants Candidates for the nine-month SM program in Health Policy and Management generally hold graduate professional degrees and have significant experience in health services. Typical applicants to the program are professionals in medical or health-related disciplines who expect to devote a substantial portion of their careers to the production and/or management of research.

The program is also designed to satisfy similar needs of health professionals who do not necessarily hold an advanced degree, but who have eight to ten years' work experience in the health services area with a high degree of responsibility, and who wish to acquire management and research skills relevant to their career interests.

All applicants must demonstrate through course work, work experience, and/or aptitude test performance (GRE, GMAT, LSAT, MCAT, or DAT) the ability to master the quantitative and analytic content of the program.

DOCTOR OF SCIENCE/DOCTOR OF PUBLIC HEALTH

The doctoral program prepares its graduates to perform research at the academic or professional level. The program builds linkages between doctoral students and faculty members engaged in the department's priority research areas.

Students select a disciplinary major, a disciplinary minor, and a substantive minor. Disciplinary areas include economics, management, program evaluation, decision sciences, political and organizational analysis, and statistics. Substantive areas include health financing and insurance, management of health hazards, management of health care organizations, evaluation of biomedical technology, and international health. Advanced doctoral seminars are offered periodically in each of the disciplinary areas.

Doctoral theses comprising original research are advised by committees of three or more faculty members. A thesis is usually comprised of three publishable papers.

Background of Applicants Applicants should have strong aptitude or competence in a quantitative discipline (demonstrated through course work, work experience, and/or aptitude test performance on the GRE, GMAT, MCAT, or DAT), experience in the health sector, ability to organize and perform independent projects, and good interpersonal skills. Direct admission to the doctoral program is generally reserved for persons with relevant graduate education. Persons without prior graduate education may be directly admitted if they have an outstanding undergraduate record.

Career Outlook The department has developed an effective job placement mechanism which includes numerous contacts with potential employers on a national and international scale, a process which begins in the first year. A system of faculty networking as well as an extensive database of alumni and professional contacts are used to link students with a broad range of health policymakers and executives. Practitioners are often invited to the department to discuss their work and career paths.

Some positions taken by recent graduates include financial manager for a health maintenance organization, administrative director of a primary care center, environmental policy officer for a manufacturing firm, policy analyst for a legislative committee, consultant for an international health organization, products manager for a major corporation, and assistant director of a community health center.

Post-graduate job opportunities in the United States are extremely limited for international students studying under a student visa. Foreign students should not, therefore, anticipate working in the United States following completion of their degree program. Opportunities for exceptionally experienced foreign students occasionally exist within international health organizations. Foreign students normally return to their home countries where they find suitable positions through their own personal and professional contacts.

For more information The director of the master's program is Dr. David Calkins. The director of doctoral training is Dr. Milton Weinstein.

■ DEPARTMENT OF MATERNAL AND CHILD HEALTH

Isabelle Valadian, Professor of Maternal and Child Health and Chairman of the Department

Faculty Professor Curran; Visiting Professor Earls; Associate Professors Crocker, Guyer, and Sachs; Assistant Professors Lieberman and Wise; Lecturers Deykin, Gardner, and D. Walker

Adjunct Faculty Professor Dwyer

The goal of the Department of Maternal and Child Health is to improve the health status of mothers and children through the training of health professionals, through basic and applied research, and through involvement in advocacy and community service.

The academic curriculum includes courses on the physical, social, and cognitive stages of human development from conception to adulthood; on MCH health services; on the role of governmental, private, and voluntary health agencies; and on the methodology of program planning, policy formation, and program evaluation in maternal and child health.

All concentrators in MCH are expected to acquire an understanding of normative growth and development, of maternal and child health services, of the legislation which supports health and social services for mothers and children, and of the planning of such services.

Activities of the Department Current areas of research include the following:

- Patterns of growth, maturation, and behavioral, social, and nutritional changes in an aging cohort; the relationship between adult health and child health and development; statistical methodology for analyzing processes of growth and development (Longitudinal Studies of Child Health and Development, started in 1930)
- Survey and assessment of Massachusetts' health services providing care for children with chronic illness or disability
- Characteristics of adolescent suicide completers
- Development of standards of care for children with special health care needs
- Comorbidity among chemically dependent adolescents
- Manifestations of depression in the older adolescent
- Computerized screening of pregnant women for nutritional risk
- Assessment of teen pregnancy and parenting programs
- Policies and strategies for preventing high risk adolescent behaviors
- Planning and performance of state MCH agencies
- Case studies of planning, policy development, and performance of State Title V agencies
- Unintentional and violence-related injuries to children and young adults. The New England Injury Research Center and the Childhood Injury Prevention Resource Center promote research and implement injury prevention programs through action of state health departments and maternal and child health agencies
- Risk factors for adverse pregnancy outcome
- Maternal smoking and fetal lung development

Degree Programs
Master of Science in Maternal and Child Health
Doctor of Science
Doctor of Public Health

The Master of Science (SM) program is designed for students who wish to focus in depth on maternal and child health. The department offers both a one-year and a two-year program, depending on the background of the student. Candidates for the one-year SM must fulfill at least 20 credit units in departmental offerings, and candidates for the two-year SM, at least 30 credit units. Occasionally, courses offered in other areas of Harvard University may be substituted to meet this requirement.

A two-year/two-degree program is available for eligible nurses to study half-time for a Master of Science in Maternal and Child Health and half-time for a Master of Science in the Primary Care Program in Parent-Child Nursing of Simmons College. The curriculum prepares nurses for leadership roles in community-oriented primary care for parents and children. Nurses interested in the two-year/two-degree program must apply to and be accepted by both the Harvard School of Public Health and Simmons College. For more information, contact Jane Gardner, DSc, in the Department of Maternal and Child Health, or Patricia Edwards, EdD, Simmons College, 300 The Fenway, Boston, MA 02115.

Doctoral candidates must spend at least two years in residence completing course work leading to a major in MCH and a minor in two other fields. Successful completion of the departmental exam and of the school's doctoral qualifying exam permits the student to undertake independent research culminating in a written dissertation.

Background of Applicants Applicants eligible for the one-year SM program are established practitioners or investigators holding a prior master's or doctoral degree in a related field such as medicine, dentistry, nursing, social work, nutrition, physical therapy, psychology, health education, or anthropology.

Applicants eligible for the two-year SM program have either a master's degree in a field unrelated to health (such as law, education, sociology, or statistics) or a bachelor's degree in a health-related field and exceptional relevant work experience.

Applicants to the two-year/two-degree program hold a bachelor's degree from a program accredited by the National League for Nursing, a license to practice nursing, and the equivalent of at least three years of full-time nursing experience in maternal and child health. International nurses with equivalent backgrounds are also eligible to apply. Applicants must meet the general admissions requirements of both the Harvard School of Public Health and Simmons College.

Applicants to the doctoral programs must have an advanced degree in a health field related to maternal and child health. Applicants are expected to have a sound academic record with documented proficiency in the quantitative sciences, relevant experience, and research interest in an area consonant with the goals of the department.

Career Outlook Graduates of the master's program generally obtain positions in local, state, national, or international health agencies. Some positions taken by recent graduates include planner for the Indo-Chinese refugees' health programs for Rhode Island, director of maternal and child health for New Mexico, director of maternal and child health for the Emirate of Qatar, and nutrition consultant for the United States Public Health Service regional office.

Students completing the doctoral program usually assume academic posts in graduate schools of public health, nursing, social work, and related disciplines. Others assume positions of responsibility in national and international organizations and foundations.

Fellowships A limited number of tuition fellowships may be available to master's degree candidates who are United States citizens concentrating in the Department of Maternal and Child Health.

Dr. Isabelle Valadian and Dr. Jane Gardner (seated, left) consult with colleagues at the Family Planning Institute in Tiachung, Taiwan.

■ DEPARTMENT OF NUTRITION

Peter Goldman, Professor of Health Sciences in Nutrition and Acting Chairman of the Department

Faculty Professors Antoniades, Lown, and Willett; Assistant Professors Storch and Sul; Lecturers Herrera-Acena, Reinhold, and Witschi

The Department of Nutrition provides training and research opportunities in basic science relating to nutrition and in practical aspects of nutrition as they affect public health. Nutrition policy and the evaluation of nutritional interventions are long-standing interests of the department, particularly as they concern problems in Latin America, Africa, and Asia, as well as in the United States. Other interests of the department range from molecular biology to human epidemiology. Students learn and use the latest techniques in biochemistry, physiology, and related fields. Research, whether basic or applied, is relevant to human health.

Activities of the Department Current areas of research include the following:

- Regulation of cell growth by hormonal growth factors and the mechanisms of such regulation
- Regulation of cellular metabolism by insulin and nutrients
- Regulation of membrane lipid transport
- Use of state-of-the-art mass spectrometry to study the structure of complex carbohydrates and glycoproteins
- Pharmacological and psychological aspects of sudden cardiac death
- Development of methods to assess nutritional status by an analysis of body fluids
- Use of computers for interactive dietary analysis and counseling
- Effects of nutrition programs and methodology on the mental and physical consequences of malnutrition

Degree Programs
Doctor of Science
Doctor of Public Health

Areas of Concentration
Nutritional Biochemistry
Epidemiology/International Nutrition

CONCENTRATION IN NUTRITIONAL BIOCHEMISTRY

The doctoral program in nutritional biochemistry trains highly qualified individuals interested in laboratory-oriented approaches to solving nutrition and metabolic problems. Students are required to take graduate courses in biochemistry, physiology, epidemiology, biostatistics, and the following courses in nutrition:

1. NUT 201a/201b, *Principles of Nutrition* (2.5 units each period)
2. NUT 204ab/204cd, *Departmental Seminars* (2.5 units each semester)
3. NUT 205cd, *Biochemistry and Physiology of Nutrition* (5 units)
4. NUT 214ab/214cd, *Research Techniques in Nutritional Biochemistry* (5 units each semester)
5. 5 units from other formal courses in the Department of Nutrition

Students must also take formal course work in two minor fields, one of which must be biochemistry and the other chosen from the other basic medical sciences. Research is begun during the first year.

Background of Applicants Students with a bachelor's or master's degree may apply for admission to the Doctor of Science (SD) degree program in nutritional biochemistry. An excellent background in chemistry, biology, nutrition, or some other relevant science discipline is necessary for admission.

Dr. Hei Sook Sul (right), Assistant Professor of Biochemistry in the Department of Nutrition, observes as Dr. Joe Gauss conducts a laboratory experiment.

CONCENTRATION IN EPIDEMIOLOGY/ INTERNATIONAL NUTRITION

Some students undertake a joint doctoral program in the Departments of Nutrition and Epidemiology. This program furnishes thorough training in both of these disciplines, enabling graduates to apply sound epidemiological methods to an ever-increasing number of nutritional problems. Students in the joint program must satisfy the course requirements in both departments and must select a minor field acceptable to both departments. The thesis will concern a topic in both nutrition and epidemiology.

Background of Applicants Admission to the joint SD degree program requires a strong background in biology and mathematics and the approval of both the Department of Nutrition and the Department of Epidemiology.

Applicants to the joint SD program or the Doctor of Public Health program should contact the Department of Nutrition before formally applying.

Career Outlook Some positions taken by recent graduates include assistant professor of biochemistry at a university, assistant professor and research associate at schools of medicine, postdoctoral research fellows in medical centers and universities, nutrition research director at a major food company, nutritionist at a school of public health, director of nutrition support service in a medical center, community nutritionist for a state health project, local health clinic administrator, food analytical chemist for an industrial firm, nutritionist for a federal nutrition evaluation agency, and nutrition educator for a national Tunisian institute.

■ DEPARTMENT OF POPULATION SCIENCES

Lincoln C. Chen, Taro Takemi Professor of International Health and Chairman of the Department

Faculty Professors Alonso, Dyck, J. Harrington, Levins, and Salhanick; Associate Professors Frisch, Larson, Reich, and Shepard; Lecturers Berggren, Cash, Henn, and Herrera-Acena; Member of the Faculty Lewontin

Adjunct Faculty Professors Caldwell, Hareven, and Ramalingaswami; Lecturer Strachan

The Department of Demography and Human Ecology was established in 1962 (renamed the Department of Population Sciences in 1969) and the Center for Population Studies in 1964 (see *International Health Programs*). These actions were taken under the conviction that rapid population growth hampers efforts to provide better housing, education, nutrition, health services, and medical care, and that the disparity between rates of population increase and rates of development of human and economic resources is a crucial problem in many parts of the world. As the view of the role of population change in health and welfare has matured, increasing attention has been given to questions of the broader interrelations among population structure, health and welfare, and social change in both developing and industrialized countries.

Faculty affiliated with the department are specialists in biology, biostatistics, demography, ethics, economics, sociology, ecology, genetics, medicine, and community-oriented public health. The department's degree programs prepare students to participate in population programs as administrators, researchers, and educators. They aim to develop sophistication in data and information management and evaluation, and to provide a broad philosophical perspective on problems and issues in the population field and on related issues of health and health care affecting communities.

A large percentage of the students in the department are from or are primarily interested in health and population problems of developing countries (see *International Health Programs*). Each year, the department sponsors a field visit to Haiti.

Activities of the Department Current areas of research include the following:

- Biochemical and endocrinologic mechanisms controlling fertility
- Long-term impact of demographic changes within the United States
- Interactions of fertility, income distribution, and other aspects of socio-economic development
- Interactions of family planning with fertility, nutrition, and infectious diseases within defined communities
- Community diagnoses of causes of rates of birth, death, and migrations
- Biological aspects of population programs
- Ethical aspects of population policies and programs
- Analysis of data collected in field studies in developing countries, including studies of mortality, morbidity, nutrition status, fertility, and impact of programs
- Factors that might improve food production
- Mathematical and experimental study of human ecosystems

Degree Programs
Master of Science in Population Sciences
Doctor of Science
Doctor of Public Health

Programs of study are offered in the areas of population, health, and nutrition; the design, management, and evaluation of population programs; the analysis of complex ecological systems; demographic analyses; reproductive biomedicine; and community-oriented public health. The programs of individual degree candidates vary widely, reflecting the diversity of the students' backgrounds, national origins, previous education, areas of professional concern, and career goals.

Background of Applicants Students with bachelor's degrees in biological sciences, social sciences, or other population-related fields generally spend two years in residence toward the Master of Science (SM) degree. Students with advanced degrees or with extensive work experience generally complete study toward the SM degree in one year. Approximately one-fourth to one-half of those who complete the SM degree enter the doctoral program.

Career Outlook Some positions taken by recent graduates include director of a university center for population studies, principal statistician, executive secretary of an international committee on applied research in population, president of a medical services consultants' group, medical director of a planned parenthood association, director of a medical clinic, program officer for the United Nations Fund for Population Activities (UNFPA), UNFPA coordinator, population intern for USAID, and associate program officer in health and nutrition for UNICEF.

■ LABORATORY OF TOXICOLOGY

Armen H. Tashjian, Jr., Professor of Toxicology and Director of the Laboratory

Faculty Associate Professors Samson and Toscano; Assistant Professors Farr and Schlegel

Adjunct Faculty Lecturer Ofner

Toxicology is the study of the injurious effects of chemicals. The scope of modern toxicology is broad and depends on the integration of knowledge and techniques from the medical, biological, chemical, and physical sciences. The faculty and staff of the laboratory reflect this multidisciplinary aspect of toxicology.

Activities of the Laboratory Current areas of research include the following:

- Receptor-mediated toxicity
- Tumor promotion
- Biochemical and genetic responses to oxidative stress
- Molecular toxicology
- Mechanisms of dioxin action and toxicity
- Molecular biology of DNA repair and mutagenesis in prokaryotes and eukaryotes
- Development and use of animal and human cell culture models
- Regulation of early mitotic events in mammalian cells

Degree Programs
Doctor of Science, granted by the Harvard School of Public Health
Doctor of Philosophy in Pharmacology (Toxicology), granted by the Division of Medical Sciences of the Faculty of Arts and Sciences
The degree granted is determined by route of entry.

The research and training program in toxicology provides students with knowledge of the health implications of environmental chemicals, interactions of toxic agents with cellular systems, biochemical mechanisms of toxicity, identification of toxic environmental chemicals, and prevention or reversal of adverse effects where possible.

The first year is usually devoted to course work. Students take courses at the Harvard School of Public Health, the Division of Medical Sciences, and other Harvard graduate programs. Appropriate courses may also be taken at MIT. Students are expected to pass a qualifying examination before the end of the fourth semester and complete thesis research within four to five years of residence.

First-year students have the opportunity to broaden their research skills by rotations in at least three different laboratories for ten weeks each. The laboratory rotation experience is supervised by each laboratory head and enables students to become familiar with a variety of research problems and techniques. At the end of each rotation, students prepare a brief written report and give an oral presentation.

Students participate in journal clubs and weekly laboratory research meetings. Students who are well advanced in their thesis research are encouraged to present their research at appropriate national scientific meetings.

Background of Applicants Candidates should have a bachelor's degree and demonstrated knowledge of organic, physical, and biological chemistry, general biology, physics, and calculus. A personal interview is strongly encouraged. The Graduate Record Examination (GRE) is required.

Career Outlook Some positions taken by recent graduates include postdoctoral research fellowships at academic institutions, junior faculty positions, and staff positions at federal agencies or industrial laboratories.

For more information For a brochure detailing the program and the interests of its faculty, contact Elizabeth Remar, Administrator, Laboratory of Toxicology, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1178).

Associate Professor of Toxicology Leona Samson studies how cells respond to DNA damage at the molecular genetic level.

■ DEPARTMENT OF TROPICAL PUBLIC HEALTH

John R. David, John LaPorte Given Professor of Tropical Public Health and Chairman of the Department

Faculty Professors Chernin, Pan, Piessens, and Spielman; Associate Professors Caulfield, Harn, Ribeiro, and Wirth; Assistant Professors Cattani, Maguire, Peattie, Shoemaker, and Titus; Lecturer Cash

Parasitic diseases are a major health problem in the developing world, particularly in tropical regions. In the Department of Tropical Public Health, research and teaching center on the biological and ecological aspects of protozoan and helminthic diseases, as well as tuberculosis and Lyme disease. The department offers opportunities for basic study of the biology of parasitism and practical work aimed at development of better tools for diagnosis, vaccines, and control. The program accepts students at the master's, doctoral, and postdoctoral levels.

A Program of Tropical Medicine and International Health has been developed involving the faculty of the Department of Tropical Public Health at the School of Public Health and the Division of Tropical Medicine at Harvard Medical School. The program takes a multidisciplinary approach to parasitic diseases, using immunology, molecular biology, medical entomology, cell biology and ultrastructure, biochemistry, pathology, and epidemiology. The program includes research within the schools and field collaborations overseas in Brazil, Venezuela, Colombia, Mexico, Kenya, Sri Lanka, Egypt, Thailand, India, China, and Indonesia.

Activities of the Department Current areas of research include the following:

- Immunology of schistosomiasis, leishmaniasis, and tuberculosis
- Immunology of filariasis and onchocerciasis
- Control of gene expression in *Plasmodium sp.* and *Leishmania sp.*
- Development of DNA probes to detect parasite infections
- Molecular biology of *Giardia* and *Entamoeba sp.*
- Receptor function and endocytosis in *Plasmodium falciparum*
- Epidemiology of leishmaniasis, malaria, and schistosomiasis
- Medical entomology and ecology of Lyme disease
- Molecular biology of insect vectors
- Biochemistry, immunology, and pharmacology of insect saliva
- Parasitology

Degree Programs
Master of Science in Tropical Public Health
Doctor of Science
Doctor of Public Health

Areas of Concentration
Tropical Public Health
Biology and Epidemiology of Parasites
Vector Biology, Ecology, and Control

CONCENTRATION IN TROPICAL PUBLIC HEALTH

The basic course (TPH 201a) provides students with a comprehensive understanding of the major parasitic diseases, emphasizing epidemiology and control. Other courses deal with various aspects of parasitism, particularly the biology, immunology, molecular biology, vector biology, cell biology, and pathology associated with parasites and their vectors. Although ecological, epidemiological, political, and social aspects relevant to control of infectious agents are integrated into the teaching programs, the focus of the department's research remains primarily in the biological aspects of the host-parasite relationship.

This program, which leads to the Master of Science (SM) degree, provides students trained in the health sciences with the background necessary to promote research or service careers in developing countries. It introduces them to the significance, recognition, and prevention of the major infectious disease problems of developing countries. Students satisfy basic course requirements in biostatistics, epidemiology, and tropical public health.

Students take specialized courses offered by the department according to their area of interest and future needs. In addition to the courses offered in the Department of Tropical Public Health, students preparing for a career in international health should take courses offered by other departments, focusing on allocation of resources and on the social, economic, and political factors in public health.

CONCENTRATION IN THE BIOLOGY AND EPIDEMIOLOGY OF PARASITES

This program introduces students to recent advances in the area of biology and epidemiology of parasitic diseases and provides background for conducting research on these diseases. Emphasis is placed on molecular biology, immunology, cell biology, and epidemiology. In this concentration, the Master of Science (SM) degree is usually regarded as preparation for the Doctor of Science (SD) program.

Students satisfy basic course requirements in tropical public health, biostatistics, and epidemiology, and take advanced courses in this department as well as at the Medical School and at the Graduate School of Arts and Sciences. Students are expected to enroll in tutorials or to carry out laboratory research projects in addition to their formal course work. The research program emphasizes molecular biology, immunology, cell biology, and epidemiology of parasites.

CONCENTRATION IN VECTOR BIOLOGY, ECOLOGY, AND CONTROL

This program introduces students to the various arthropod and molluscan vectors of human infection and develops an appreciation for the biology of these organisms and the means for their control. It prepares students to plan and evaluate control programs and develops skills with respect to identification, maintenance, and experimental procedures involving these organisms.

In addition to required courses in epidemiology and biostatistics, participants in the program take courses in vector biology, molecular biology, immunology, and parasitology. Depending upon the particular interest of each student, courses in cell biology, invertebrate physiology, pathology, genetics, population ecology, and computer sciences may be required. The research program emphasizes experimental ecology, biochemistry, physiology, and molecular genetics.

Background of Applicants Students in all three programs normally have at least a bachelor's degree, but can enter at any level of advanced training, including the postdoctoral level.

Career Outlook Some positions taken by recent graduates include academic and administrative posts in programs dealing with the control of tropical, parasitic, and vector-borne diseases or with research on these entities. Posts are in the public and private sectors and at the national and international levels.

DIVISION OF BIOLOGICAL SCIENCES IN PUBLIC HEALTH

Elkan R. Blout, Professor in the Faculty of Public Health and Director of the Division of Biological Sciences in Public Health

The goal of the Division of Biological Sciences in Public Health is to strengthen the scientific basis and application of biological knowledge and methodology to major issues of public health. To accomplish this, the division brings together faculty members and training programs from departments with strong biological components, including Cancer Biology, Environmental Science and Physiology, Nutrition, Population Sciences, and Tropical Public Health, as well as the Laboratory of Toxicology. Members of the Departments of Biostatistics and Epidemiology also share the division's goals.

Through the division, the school offers a multidisciplinary doctoral program in biological sciences in public health. The division is designed to provide training for able students committed to a career in this field who have not yet selected an area of concentration. Students are admitted to the division as candidates for a Doctor of Science degree. The degree is in the department or discipline in which the student performs thesis research. Applicants who have already chosen a field of study should apply directly to the appropriate department, rather than to the division.

Degree Program
Doctor of Science

Students in the division take courses for one to two years to gain a thorough grounding in the biological sciences and in elements of the biomedical sciences and epidemiology. In the first year, students rotate for ten-week periods through various laboratories and participate in division-sponsored seminars. This prepares students to make an informed choice of topic and academic adviser before embarking on doctoral thesis research, which ordinarily requires three to four years to complete.

Course requirements are flexible to accommodate students with diverse backgrounds and career goals. With their advisers, students select a program that might include courses in biochemistry, cell biology, pharmacology, virology, immunology, genetics, and physiology. The program's required courses are as follows:

1. DBS 205ab/205cd, *Interdepartmental Seminar in the Biological Sciences.* 2.5 units each semester. Research seminars by division faculty.
2. DBS 206ab, *Papers in the Biological Sciences: Past and Present.* 2.5 units. Discussion of "classic" papers in biology from the perspective of logic and experimental design.
3. DBS-BIO 207b, 207cd, *Statistical Methods in Biology.* 7.5 units. Designed to provide competence in the major statistical methods essential for laboratory research.
4. DBS-ESP 221cd, *Methodology in Cell Biology.* 5 units. An overview of experimental approaches in cell biology used to study cell structure and function.
5. EPI 201a, *Principles of Epidemiology.* 2.5 units. Basic principles and methods of epidemiology.
6. DBS 300ab/300cd, *Laboratory Rotations.* 5 units each semester.

Background of Applicants Applicants generally have a bachelor's degree and demonstrated competence in organic and biological chemistry, general biology, physics, and calculus. Applicants deficient in one of these areas may be admitted provisionally, on the basis that appropriate courses are taken before and/or after entry. Three letters of evaluation are required from instructors of science and mathematics, and applicants who have worked in relevant areas should also supply evaluation letters from employers. The Graduate Record Examination (GRE) is required. Applicants wishing to visit the school are encouraged to come for an interview.

Financial Aid The division provides eligible students with two years of financial support (full tuition plus stipend). Thereafter, the student is supported by the department or laboratory in which the thesis work is conducted.

For more information Please refer to the section *Degree Requirements* for general information about the Doctor of Science degree. The section *Departments and Laboratories* provides information about departmental concentrations. Applicants to the Division of Biological Sciences should contact the division before formally applying. Please contact Rebecca Siebens, DBS Coordinator, 665 Huntington Avenue, Room 1302, Boston, MA 02115 (telephone 617-732-0926).

INTERNATIONAL HEALTH PROGRAMS

Lincoln C. Chen, Taro Takemi Professor of International Health

The International Health Programs Unit seeks to promote international health research and education throughout the Harvard School of Public Health. Faculty members associated with the International Health Programs Unit all have appointments in academic departments within the school, and join the unit to pursue interdisciplinary and interdepartmental research and educational activities.

The educational activities of the International Health Programs Unit are designed to strengthen the school's educational programs in international health. These programs are of four types. First are master's-level degree programs of one or two years for students interested in international public health professional practice. (See *Health Policy and Management, Population Sciences*, and other departments for program descriptions.) Second, the International Health Programs Unit aims to strengthen the international health component of doctoral training programs based in various departments of the school. Third, at the postdoctoral level, the Takemi Program in International Health provides a base for nondegree interdisciplinary research by mid-career Fellows. Finally, the school occasionally offers short-term executive or overseas training programs. Overseas programs administered by the International Health Programs Unit and by departments and faculty members provide opportunities for study, research, and service, often in collaboration with overseas educational and research institutions.

■ PROGRAM FOR PROFESSIONAL EDUCATION IN INTERNATIONAL HEALTH

Richard A. Cash, Lecturer on Tropical Public Health and Director of the Program for Professional Education in International Health

The Program for Professional Education in International Health advises and guides master's-level degree students interested in international health in the selection of appropriate programs and courses, and participates in the coordination of international health activities within the school.

The school provides numerous opportunities for students interested in teaching, research, and service in international health, with particular emphasis on health problems of developing countries. Special courses are offered that focus primarily on developing countries, including courses on international health policy, parasitic and infectious diseases, nutrition and maternal and child health, health services, health planning, management, and program implementation. Case studies and illustrative materials from developing countries are included in readings and discussions in the core curriculum and in many other courses.

In addition to the courses regularly available in the school, tutorials and courses can be arranged where the interests of students and faculty members coincide. During the 1988–89 academic year, for example, two such courses were offered: *Urban Primary Care in Developing Countries* and *Disaster Preparedness and Relief in Developing Countries.* Cross-registration opportunities for students interested in medicine, economics, public administration, education, anthropology, government, social relations, and additional subject areas are available in other faculties within Harvard University and also at MIT.

Faculty members active in international health have had experience in Latin America and the Caribbean, Africa, Asia, and the Middle East. They are drawn from various departments and faculties throughout the university, giving international health an interdisciplinary orientation. Students at the school last year came from more than forty different countries.

Field Experience and Study

The School of Public Health encourages all students interested in international health to gain field experience overseas. During the 1988–89 school year students participated in courses in Haiti and Mexico and individual students were involved in projects in over twelve countries.

Students concentrating in international health in Health Policy and Management as well as other departments often fulfill their summer internship requirements overseas or with an international organization in the United States. Faculty may assist students in locating placements, and limited school funds are available for travel. A registry of possible assignments has been produced for interested students.

During the summer of 1990 it is anticipated that a noncredit course in field-based epidemiology will again be offered in Mexico City. This four-week course focuses on one specific health problem and appropriate techniques for addressing that problem. Topics recently studied include malnutrition and the control of diarrheal diseases.

Permission of the instructor and fluency in Spanish are required, and enrollment is limited to ten students. For more information, please contact Dr. Richard A. Cash, Program for Professional Education in International Health, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1076).

■ TAKEMI PROGRAM IN INTERNATIONAL HEALTH

Michael R. Reich, Associate Professor of International Health and Director of the Takemi Program in International Health

The Takemi Program in International Health offers fellowships for research and advanced training on critical issues of international health, especially those related to developing countries. The program addresses problems of mobilizing, allocating, and managing scarce resources to improve health, and of designing solid strategies for disease control and health promotion. Through its fellowships, the program aims to contribute to institutional development and improvement of national policy in the individual's home country, and to the advancement of general knowledge. The program is named for Dr. Taro Takemi, the distinguished physician-scientist who served for more than 25 years as president of the Japan Medical Association.

The primary goals of research under the Takemi Program are to investigate how resources are allocated and used for health purposes in both rich and poor countries and to develop methods for making such choices more rational and equitable. The program also strives to promote cooperative research and comparative analysis of health policies and programs in different countries, and to study transnational causes of ill health, such as population migration and disease transmission, and air and water pollution.

Currently, the program's research focuses on a few of the world's most urgent health needs, particularly those of the developing countries, and the most effective ways to meet them. Areas of research

The 1988–89 Takemi Fellows: (front row, left to right) Naruo Uehara (Japan), Cai Jin-wen (China), Khor Geok Lin (Malaysia), Orville Solon (Philippines); (back row) Xu Xiping (China), Mukund Uplekar (India), Chinyelu Okafor (Nigeria), Rukarangira Wa Nkera (Zaire).

have a strong practical emphasis and include the assessment of health technology; the structure, organization, and financing of health care; and the relationships among rapid population growth, increasing pressures on the environment, and health status. In all areas of research, the program emphasizes the social and cultural factors that shape a country's efforts to improve health.

Each Takemi Fellow is responsible for a specific research project. Fellows use data they bring with them, and the projects are closely linked to action programs and to the work Takemi Fellows will do after returning home. Program findings and results are disseminated widely, and opportunities are sought to apply them in various settings.

Fellows also participate in the weekly Takemi seminar. As the program's teaching activity, these seminars examine the question of how to set priorities under conditions of limited resources and evolving technology. The program sponsors several open lectures each year to discuss important issues in international health, to explore possible research themes for the program, and to educate Harvard students and faculty on the state of knowledge and research in international health.

The Takemi Program is not degree oriented, as course requirements would substantially reduce the time available for research and writing. Upon completion of the program, Takemi Fellows receive a certificate. Takemi Fellowships are generally awarded for ten months. Most Takemi Fellows are supported by external funds raised by the Fellow in cooperation with the program staff.

Background of Applicants Applicants for Takemi Fellowships are highly qualified young and mid-career professionals and scholars from around the world with backgrounds in public health, medicine, economics, administration, biological science, and other fields.

■ SPECIAL PROGRAMS AND PROJECTS

The following are programs and projects located in the International Health Programs Unit. Selected research or training opportunities may be available for students in connection with these projects.

Commission on Health Research for Development

The Commission on Health Research for Development is an independent international commission, most of whose members come from developing countries. Funded by fifteen foundations and international agencies, the commission is analyzing the strengths, weaknesses, and gaps in current research on health problems in developing countries and reviewing current major international support programs. It will make proposals and promote actions to strengthen the capacity of developing countries to identify and solve their own health problems through basic and applied health research. The commission was launched in November, 1987, and a report of its findings will follow the final meeting in November, 1989. The secretariat of the commission is operated by the International Health Programs Unit of the Harvard School of Public Health, backed by consultants and advisers from many countries of the world.

International Research Network on AIDS and Reproductive Health

The Harvard School of Public Health serves as the support base for a multidisciplinary international scientific network on AIDS and reproductive health. This network provides stable long-term scientific and training opportunities for members' research teams and promotes exchange of information on AIDS research and prevention on the international, national, and regional levels. Strategies for epidemiological and social science research, health education, and other interventions are emphasized. Members of the network pursue their own research while also learning from the experiences of others working on similar problems in other settings. Harvard participants are co-equal members of the network.

India-Harvard Exchange in Health Policy and Management

A modest program for cooperation and exchange of professionals is underway between India and the Harvard School of Public Health. This venture will involve a co-equal exchange of students, faculty, and collaborative research in health economics and financing, health management information systems, and field epidemiology in India. Joint course development and collaborative research may follow. Arrangements have been made for short-term exchanges of students and faculty. This project has potential for improving the understanding of health and development and the role of government policies in shaping health improvement in India and internationally.

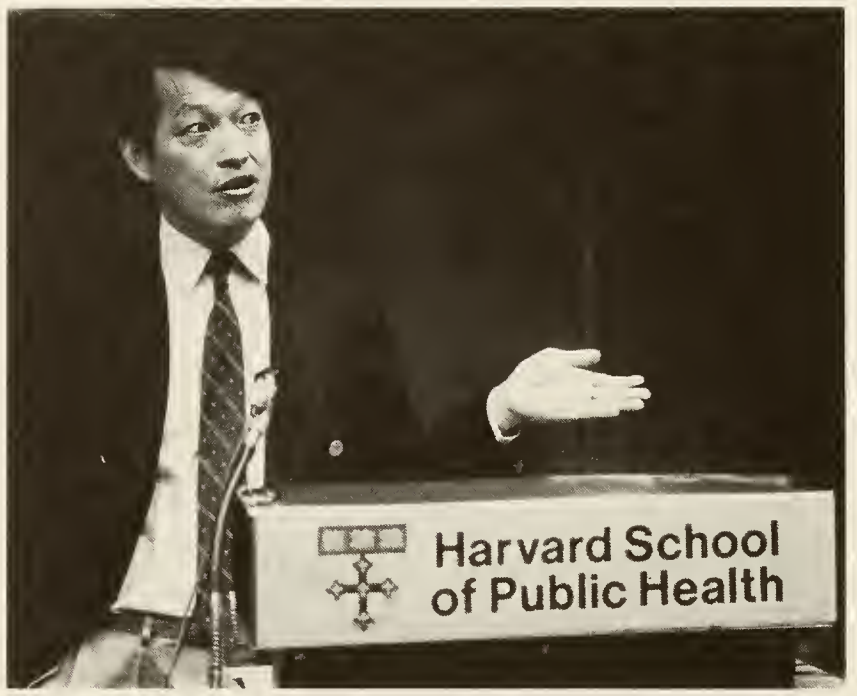
Health Transition Program

The Health Transition Program is a multi-faculty, interdisciplinary program aimed at reviewing and ultimately strengthening social science contributions to health improvement in developing countries. The program is concerned with research on the social processes that contribute to lower mortality rates, and the ways in which public policies, political strategies, and administrative structures affect health. The program is a joint project of the Department of Population Sciences and the International Health Programs Unit.

■ HARVARD INSTITUTE FOR INTERNATIONAL DEVELOPMENT

Albert E. Henn, Lecturer on International Health and Associate Director for Health Programs

Located in Cambridge, Massachusetts, the Harvard Institute for International Development (HIID) provides technical assistance to developing countries on programs, strategies, and policies that promote health and development. Many of the staff of the HIID Health Office hold joint appointments at HIID and the School of Public Health. These faculty undertake research and teaching related to public health issues. Students may find opportunities to collaborate on HIID activities in Cambridge during the school year through the work-study program. Other students may gain field experience through participation in overseas projects. Selected students may receive fellowships to work with HIID following graduation.



Dr. Lincoln Chen, Taro Takemi Professor of International Health, directs the Center for Population Studies and chairs the Department of Population Sciences.

■ CENTER FOR POPULATION STUDIES

Lincoln C. Chen, Taro Takemi Professor of International Health and Director of the Center for Population Studies

The Center for Population Studies was established in Cambridge in 1964 under the leadership of the Harvard School of Public Health as a university-wide center for the study of human population problems. The members and research associates of the center are drawn from the departments of Biology, Economics, Government, Sociology, and the Division of Applied Sciences in the Graduate School of Arts and Sciences; from the faculties of Public Health, Design, Divinity, Education, Government, and Medicine; and from MIT.

The present research programs of the center focus on several themes: economic, social, and environmental causes and effects of population change and their implications for population policy; problems of urbanization and migration in both developed and developing countries; the population of China; the influence of health care on contraceptive use and breast feeding; and the effect of nutrition and exercise on women's reproductive health.

■ POSTDOCTORAL FELLOWSHIPS

Some departments, particularly Biostatistics and some laboratory-oriented departments such as Cancer Biology, Environmental Science and Physiology, and Tropical Public Health, offer opportunities for postdoctoral research and training. Research fellows generally work with principal investigators on continuing research projects and may also serve as teaching assistants. Research fellows may be salaried, may be offered a stipend, or may be required to supply their own funding from public or private sources. For more information about postdoctoral opportunities, please contact the administrator or chairman of the relevant department.

■ INTERDISCIPLINARY PROGRAMS IN HEALTH

Postdoctoral Program

Donald F. Hornig, Professor of Chemistry in Public Health and Director of Interdisciplinary Programs in Health; John S. Evans, Associate Professor of Environmental Science and Director of the Program in Environmental Health and Public Policy

The Program in Environmental Health and Public Policy was launched in 1977 as part of the Interdisciplinary Programs in Health. Its primary objective is to enlist scholars from the natural and social sciences in finding new ways to deal with the critical environmental problems of today's society. It aims to bring to environmental problems the knowledge, skills, insights, and analytic techniques of a variety of disciplines. Based at the School of Public Health, it is a university-wide program in which members of the faculties of Arts and Sciences, Government, Law, Medicine, and Business participate. It is not a degree-granting program.

The program focuses on the scientific and analytic foundations for environmental decisions. Its aim is to provide a core around which to focus the talents and energies of individuals and groups within the Harvard community on the problems of environmental health and public policy. The central environmental dilemma facing a modern society is that the process of growth and change unavoidably introduces environmental hazards as well as benefits. These hazards must be identified, characterized, and evaluated; their relation to the social, economic, and health goals of the society must be analyzed; decisions must be made and laws and regulations written to mitigate the hazards as far as possible while encouraging the development of the society.

Within the central theme of the understanding of environmental hazards and their management, the three main foci of the program are as follows:

- Identifying and characterizing environmental chemicals as well as understanding the mechanism of their action at the molecular and cellular levels
- Tracing the flow of pollutants through aquifers, the atmosphere, and soils and relating the exposure of populations to their transport and ultimate fate
- Studying and analyzing alternative approaches to regulation after assembling the data needed for the technical, economic, and political assessment of environmental risk

IPH FELLOWS

Postdoctoral fellowships are awarded for terms of one or two years and may be renewable for a third year. Fellows devote their initial period to orientation, exploration of opportunities, and selection of projects and advisers. Experimental facilities are available in the laboratories of existing research groups. It is expected that during the term of a fellowship a substantial investigation or analysis will be completed.

Background of Applicants Fellows are promising graduates of advanced degree programs who seek preparation for careers in which their talents can be applied to environmental health-related problems, either through fundamental or applied research or through service. Fellows are chosen from the natural sciences (chemistry, biology, biochemistry, physics, and mathematics), the quantitative analytic areas (statistics, operations research, engineering, computer science, etc.), and the social sciences (economics, sociology, public policy, law, management, etc.).

VISITING SCIENTISTS AND SCHOLARS

Visitors may be on leave from universities, industry, or public interest organizations. Applicants should submit a curriculum vitae, a list of publications, a proposal for research or study to be undertaken in IPH, and a statement of the relation of IPH to their

career objectives. Stipends may be available, depending on individual circumstances and the availability of other support to the applicant.

Background of Applicants Visitors fall into two general categories: (1) Senior scientists and scholars who have made significant contributions in a discipline and now wish to apply their discipline to environmental health-related problems, and (2) individuals from government, industry, or public interest organizations who have been involved in problems of environmental health and regulation and wish to broaden their background and perspective.

■ PROGRAM IN HUMAN ECOLOGY

Special Doctoral Program

Richard Levins, John Rock Professor of Population Sciences and Head of the Program in Human Ecology

The study of human ecology in a public health context integrates social, historical, and ecological aspects of human existence in order to understand and influence the improvement of health in populations and communities. The Program in Human Ecology is an interdepartmental research and teaching program including faculty from the Department of Population Sciences and other areas. The program emphasizes the inseparability of biological and social components of the patterns of health and disease, agriculture, environmental protection, and resource use within a framework of complex systems analysis.

Degree candidates usually take further training in quantitative and qualitative mathematical approaches to complex systems, general and human ecology, and demography. Advanced courses relevant to each student's research interests are available as electives. These might include agricultural systems and production, population ecology, ecological anthropology, specialized courses in tropical public health, environmental sciences, and biology.

Background of Applicants Applicants are accepted into a doctoral program in one of the school's departments and must meet that department's admission and degree requirements as well as those of the Program in Human Ecology. Potential applicants should contact Dr. Levins to indicate their interest in being considered for the program.

■ PROGRAM IN CLINICAL EFFECTIVENESS

Special Master's Program Affiliated with the Brigham and Women's Hospital Research Training Program in Clinical Effectiveness

Howard H. Hiatt, Professor of Medicine and Director of the Program in Clinical Effectiveness; Lee Goldman, Associate Professor of Medicine

This program is intended for physicians who have completed their residencies and wish to prepare themselves for careers in clinical research, and for nurses with similar goals. The degree requirements include an intensive summer session of didactic training in biostatistics, epidemiology, decision sciences, and health economics. This is followed by research in the clinical department to which they have previously been accepted, together with graduate work that leads to a Master of Science degree in Biostatistics, Epidemiology, or Health Policy and Management. Most participants in the program spread their academic and clinical work over two years.

Application should be made to Dr. Hiatt or Dr. Goldman, Department of Medicine, Brigham and Women's Hospital, 75 Francis Street, Boston, MA 02115.

■ PUBLIC HEALTH FOR LAWYERS

Special Master's Program

William J. Curran, Frances Glessner Lee Professor of Legal Medicine and Head of the Program in Public Health for Lawyers

The dramatic expansion of legal and regulatory issues in health fields has resulted in a critical need for lawyers with formal training in the health sciences and disciplines. Growing specialty fields include hospital and health care law, personal injury and compensation law, environmental health law, occupational health and safety law, and child health law. To help meet the need for trained professionals in these areas, the Harvard School of Public Health invites lawyers to apply to its Master of Public Health (MPH) program.

The MPH program provides an incisive overview of the health field while offering specialized options for professional training in a variety of areas. Lawyers may pursue a comprehensive program in the health sciences and medical care delivery, or may tailor their programs to pursue special interests, such as the following:

- Public health regulation
- Medical malpractice and risk management
- Health care finance regulation
- Environmental and occupational health regulation
- Biomedical and pharmaceutical industry regulation
- International health and law
- Human rights and health

To supplement their studies, students may avail themselves of course offerings in other faculties of Harvard University such as the Law School, Medical School, and John F. Kennedy School of Government.

Lawyers interested in applying to the program should consult with Dr. William J. Curran, Head of the Program in Public Health for Lawyers (telephone 617-732-1090), or with Bernita L. Anderson, Director of Professional Development (telephone 617-732-1036).

Background of Applicants In addition to a law degree, applicants should have an aptitude for public health studies, as evidenced by undergraduate courses in relevant areas such as statistics, biology, economics, political science, psychology, and health sciences. Most applicants have been in law practice for several years, preferably in health law areas. Recent law school graduates who show special promise for health law careers are also encouraged to apply.

■ PUBLIC HEALTH FOR DENTISTS

Special Master's Program

Chester W. Douglass, Lecturer on Public Health Dentistry and Head of the Department of Dental Care Administration at the Harvard School of Dental Medicine

Dentists enroll in many of the degree programs at the Harvard School of Public Health, particularly in the Departments of Health Policy and Management, Epidemiology, and Maternal and Child Health. The school cooperates with the Harvard School of Dental Medicine to offer a three-year postdoctoral fellowship program which leads to a public health degree and dental specialty certificate, as described below.

Postdoctoral Fellowship Program in Dental Public Health, Epidemiology, and Dental Care Administration This program prepares individuals for creative full-time teaching, research, and administrative careers in dental public health, epidemiology, and dental care administration. Participants in the program are appointed as Clinical or Research Fellows in Dental Care Administration at the School of Dental Medicine.

The program comprises three parts of approximately one year each. One part of the program involves a formal course of study leading to a Master of Science or Master of Public Health degree. Fellows must complete the core courses in the first year at the Harvard School of Public Health, and must complete all requirements for the degree within two academic years. Candidates with an equivalent degree from another school, however, may be accepted into the program with one year advanced standing.

The second portion of the program involves a one-year supervised residency at the community, state, or national level in epidemiology or health policy and administration. This residency meets the requirements of the American Board of Dental Public Health. The third portion affords opportunity for advanced study and research at the Harvard Schools of Dental Medicine and Public Health, at other Harvard schools, and at other institutions. Fellows may carry on epidemiological or health services research over the entire three-year period in a variety of situations involving either new or continued studies. Each participant in the program prepares a research thesis for presentation at the end of the third year.

In addition to the master's degree, candidates receive a certificate of completion of residency requirements from the Harvard School of Dental Medicine. Several doctoral programs are available for fourth- and fifth-year fellows.

Background of Applicants The Postdoctoral Fellowship Program is open to dentists and other qualified health professionals who meet the admission requirements of both participating schools. Application should be made to the School of Dental Medicine, whose Committee on Postdoctoral Education will forward the applicant's file to the School of Public Health for consideration.

■ COMMUNITY HEALTH IMPROVEMENT PROGRAM

Special Nondegree Program

Director to be Announced

The Community Health Improvement Program (CHIP) is a community service and policy analysis component of the Harvard School of Public Health. CHIP's objectives are to improve the health status of communities by developing, implementing, and evaluating innovative community-based public health strategies in conjunction with community agencies, and to carry out field-based research on critical public health issues as the basis for preparation of national policy reports. CHIP addresses primarily the areas of environmental health, nutrition, and hunger, and primary care for low-income and underserved populations.

The research and service goals of CHIP are fulfilled by faculty, students, and CHIP staff who work with community agency personnel to improve the equity, efficiency, and effectiveness of health service delivery. Participants also seek to increase the usefulness of policy-relevant information and evaluation techniques.

CHIP demonstration and research projects are guided by more general needs for new public knowledge and understanding. These projects are developed by CHIP staff, faculty members associated with CHIP, colleagues from teaching hospitals and schools of public health across the nation, and students.

CHIP's recent undertakings and publications include *Hunger in America: The Growing Epidemic* (1985, Wesleyan University Press) and "Developing a Community Agenda to Combat Environmental Toxins," a 17-unit educational videotape series.

At a rainy Commencement, the HSPH Public Health Award for Outstanding Service to the Community was presented to Deborah Jackson (right), president of Morgan Memorial Goodwill Industries, and to Nathaniel Askia, founder of FIRST, a 22-year-old organization that operates public programs such as AIDS information and drug abuse workshops.

CENTERS AND OFFICES

The Harvard School of Public Health supplements its departmental research and teaching programs by supporting several centers. These units enrich the school's intellectual environment and expand students' academic opportunities by promoting interdisciplinary study and research in areas such as occupational safety and health, environmental health, and injury prevention.

Some of these organizations carry public health issues beyond the boundaries of the school. For example, the Center for Health Communication reaches out to the public by using a media-based, consumer-oriented approach to provide reliable health information. The Office of Continuing Education serves the professional community by presenting in its short courses the latest information in the fields of medical sciences and management, occupational health, nuclear safety and radiation protection, environmental management, and control of indoor environments.

The centers and offices are described in the following pages.

■ CENTER FOR HEALTH COMMUNICATION

Jay A. Winsten, Assistant Dean for Public and Community Affairs and Director of the Center for Health Communication

Through mass communication, the center seeks to strengthen public understanding of science and health and to motivate the adoption of healthy behaviors.

The center is concerned with a variety of health issues, including highway safety, smoking, substance abuse, AIDS, nutrition, fitness, and health policy. The Harvard Alcohol Project, sponsored by the center, is a research-based demonstration project designed to curb alcohol-related traffic fatalities and injuries by changing social norms concerning the acceptability of driving-after-drinking.

The center has four distinct missions:

- To serve as a source of reliable health information for writers, editors, and producers
- To develop and test new mass media strategies for disseminating health information and promoting health
- To provide educational and research opportunities for journalists
- To develop a graduate-level curriculum in mass communication for health professionals

The center sponsors the Harvard Journalism Fellowship for Advanced Studies in Public Health to provide opportunities for journalists to examine critical issues in public health through a combination of structured, problem-oriented seminars and self-directed study.

In addition, the center sponsors the Health Policy Forum, a colloquium series for the public health, business, government, and journalism communities, as well as a series of working luncheons held in New York City for magazine writers and editors.

The center's advisory board is chaired by former United States Surgeon General Julius Richmond, now Professor of Health Policy, Emeritus, Harvard School of Public Health. Other members of the advisory board are John Chancellor, NBC News senior commentator; Arnold Relman, editor-in-chief of *The New England Journal of Medicine;* Norman Cousins, Professor, UCLA; Frank Stanton, former president of CBS, Inc.; William J. Curran, Francis G. Lee Professor of Legal Medicine, Harvard School of Public Health; Joann Rodgers, past president of the National Association of Science Writers, deputy director of the Office of Public Affairs for the Johns Hopkins Medical Institutions, and vice president of the Council for the Advancement of Science Writing; David Perlman, associate editor of the *San Francisco Chronicle* and board member of the Council for the Advancement of Science Writing; Irene Pollin, executive director of the Outpatient Medical Counseling Center, Washington Hospital Center; Howard Hiatt, Professor of Medicine, Harvard Medical School and Harvard School of Public Health; and Milton Gossett, co-chairman and CEO of Saatchi and Saatchi Advertising Worldwide, Inc.

Dr. Richard Monson, Professor of Epidemiology and Director of the Educational Resource Center for Occupational Safety and Health.

■ EDUCATIONAL RESOURCE CENTER FOR OCCUPATIONAL SAFETY AND HEALTH

Richard R. Monson, Professor of Epidemiology and Director of the Educational Resource Center for Occupational Safety and Health

The primary objective of the Educational Resource Center is to train occupational safety and health professionals to recognize and prevent occupational injuries and disease. This training effort is directed toward the development of public health perspectives, the acquisition of skills and knowledge for prevention, and the creation of a sensitivity about the political climate in which professionals must act. Through the center's programs, teams of professionals learn to identify and prevent occupational impairments, disease, and injuries through the control or elimination of harmful occupational exposures.

Since occupational health relies on a number of disciplines to provide the elements of prevention and problem solution, the training is multidisciplinary in nature. Descriptions of the full-time academic programs at the master's and doctoral levels are included with the departmental description of Environmental Science and Physiology. Employment opportunities exist in universities, governmental agencies, industry, labor unions, hospitals, and clinics.

The center is partially supported by a grant from the National Institute for Occupational Safety and Health (NIOSH). Traineeship awards consisting of tuition, stipend, and health fee may be available on a competitive basis to qualified individuals undertaking approved training programs in occupational medicine, industrial hygiene and occupational safety, and occupational health nursing.

Decisions regarding funding are made independently from the application process. All United States citizens, noncitizen nationals of the United States, and permanent residents are automatically considered for funding.

Other facets of the center include a substantial sponsored research program spanning a variety of occupational health problems and drawing upon the expertise of scientists in many disciplines. The center offers midcareer training through short-term courses, seminars, and workshops for physicians, nurses, industrial hygienists, safety engineers, and other occupational safety and health professionals, paraprofessionals, and technicians. The center also has an outreach program which networks with academic institutions, agencies, professional societies, public health departments, unions, companies, and community associations within the New England region.

For further information about any aspect of the center, including student financial aid, sample curricula, and faculty research interests, contact Mr. Daryl Bichel at the Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1260).

■ KRESGE CENTER FOR ENVIRONMENTAL HEALTH

John B. Little, James Stevens Simmons Professor of Radiobiology and Director of the Kresge Center for Environmental Health

The Kresge Center serves as a focal point for environmental health-related research and training activities in the Harvard School of Public Health. It includes programs within departments such as Cancer Biology, Environmental Science and Physiology, and Epidemiology. Full-time faculty within the center include physicians, engineers, physiologists, mathematicians, toxicologists, chemists, and physicists. This diversity enables the staff to deal effectively with environmental and occupational health problems which require a multidisciplinary approach.

The center conducts research and training in the following areas: occupational health and safety, air pollution health effects and control, biochemical toxicology, radiation biology, radiological health (radiation protection), respiratory biology (inhalation toxicology), and environmental health engineering and management. Students interested in pursuing degree programs in these areas enroll in the relevant department of the Harvard School of Public Health. Students whose primary interest is in problems of hazardous waste, water quality, and water resources may apply to degree programs in Environmental Health Management or to the Division of Applied Sciences of the Graduate School of Arts and Sciences.

■ INJURY PREVENTION CENTER

Bernard Guyer, Associate Professor of Maternal and Child Health and Director of the Injury Prevention Center

The Injury Prevention Center was established at the Harvard School of Public Health as a multidisciplinary program for the reduction of death and disability due to injury, a problem that has received inadequate attention from researchers and practitioners in public health. The center's activities include research, education, policy development, and consultation with individuals, corporations, nonprofit organizations, and health and regulatory agencies.

Faculty of the center are drawn from the Departments of Maternal and Child Health, Health Policy and Management, and Epidemiology, as well as from the Medical School, the John F. Kennedy School of Government, and the Graduate School of Education. Among the faculty and staff involved in the center are John D. Graham, Associate Professor; David Hemenway, Lecturer; Susan S. Gallagher, Research Associate; and Ilana Lescohier, Project Director.

The center's major programs include the Childhood Injury Prevention Resource Center and the New England Injury Prevention Research Center. The latter is a collaborative effort with Boston University, Tufts University, the Massachusetts Department of Public Health, and the Educational Development Center, Inc. Present research addresses several themes: motor vehicle safety policy, including issues of drinking and driving and passenger restraints; unintentional injuries to children and youth, including pedestrian, home, sports, and recreational injuries; and violence and self-inflicted injuries, including interpersonal violence, the development of aggressive behavior, and suicide. The center provides consultation on research design, program development and evaluation, data systems and surveillance, prevention strategies, and related aspects of injury control.

Faculty associated with the center offer two courses on injury control and participate in other courses offered at the school. A monthly seminar series and a working paper series provide opportunities to share work in progress with professional colleagues. Students from several departments in the school participate in the center's programs.

■ OFFICE OF CONTINUING EDUCATION

Dade W. Moeller, Professor of Engineering in Environmental Health and Associate Dean for Continuing Education

Since 1982, the Office of Continuing Education has sponsored educational opportunities for midcareer professionals in health-related fields and industry. The program provides public health professionals the opportunity to keep abreast of new developments and enables them to apply, immediately, new knowledge in their work. During the 1989–90 academic year, the office will coordinate the presentation of approximately thirty-five short courses, ranging in length from two days to two weeks, and including subjects in medical sciences and management, nuclear safety and radiation protection, occupational health and safety, environmental management, and environmental and occupational law.

Course lectures are presented by faculty members of the School of Public Health, supplemented by recognized leaders working in the field. Selected courses incorporate the case method of instruction; others include laboratory sessions and demonstrations through which participants can gain hands-on experience in the use of standard field equipment. Course participants are encouraged to share their own experiences with other participants and the faculty, creating a dynamic learning environment.

The programs of the Office of Continuing Education draw participants on an international scale, attracting physicians, health care personnel, scientists, and engineers from all over the world. Most participants are employed by public health and regulatory agencies, industrial organizations, legislative committees, research and development laboratories, public utilities, and consultant groups. Over 1400 professional personnel attended these programs during the 1988–89 academic year.

Developed as an outgrowth of the Executive Programs in Health Policy and Management and the Program of Continuing Education in Environmental Health, the creation of the Office of Continuing Education demonstrates the firm commitment of the Harvard School of Public Health to professional education in public health and health management. Certification maintenance credits for these courses have been awarded by appropriate industrial and medical boards.

Listed below are the courses scheduled for presentation during the 1989–90 academic year. Many courses are also offered during the summer.

OCCUPATIONAL HEALTH

Risk Analysis in Environmental and Occupational Health
September 6–8, 1989
Indoor Air Quality
September 19–21, 1989
Industrial Ergonomics
September 25–29, 1989
Fundamentals of Industrial Hygiene
October 23–27, 1989
March 26–30, 1990
Asbestos Abatement Projects
October 30–November 4, 1989
Fundamentals of Occupational Safety
November 27–December 1, 1989
Industrial Hygiene Lab Course
April 23–27, 1990

ENVIRONMENTAL MANAGEMENT

Risk Analysis in Environmental and Occupational Health
September 6–8, 1989
Indoor Air Quality
September 19–21, 1989
Radon in Buildings: Sources, Biological Effects, Monitoring, and Control
November 6–7, 1989
March 1–2, 1990

LEGAL CONSIDERATIONS

Epidemiology and Risk Assessment for Lawyers
November 14–16, 1989

NUCLEAR SAFETY AND RADIATION PROTECTION

Occupational and Environmental Radiation Protection
March 26–30, 1990
Radiation Protection Instrumentation
May 7–11, 1990
Environmental Radiation Surveillance
June 11–15, 1990
Planning for Nuclear Emergencies
June 18–22, 1990

MEDICAL SCIENCES AND MANAGEMENT

AIDS and Infectious Disease in the Workplace
October 11–13, 1989
Managing Physicians
December 4–8, 1989
Program for Chiefs of Clinical Services
January 14–26, 1990

For more information Please write or call the Office of Continuing Education, Harvard School of Public Health, 677 Huntington Avenue, Room L-23, Boston, MA 02115 (telephone 617-732-1171).

■ ADMISSION

APPLICATION FOR ADMISSION

Applicants or potential applicants who have questions about admission requirements, degree programs, or any other aspect of applying to or enrolling in the school should contact Bernita L. Anderson, Director of Professional Development, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1036).

Application forms for admission to all degree programs and for special student status can be obtained from the Admissions Office, Harvard School of Public Health, 677 Huntington Avenue, Room G-4J, Boston, MA 02115 (telephone 617-732-1030).

The section *Degree Requirements* and the departmental descriptions in this *Register* discuss some of the requirements for admission to particular degree programs. In addition to meeting these requirements, applicants must satisfy the school's Committee on Admissions and Degrees as to their ability to undertake graduate study. The final decision as to the admissibility of an applicant rests with this committee.

Applicants may apply to one degree program only and must specify the specialty area or areas in which they plan to take the degree. If the applicant desires to take a joint program in two specialty areas, both areas should be specified and requirements for admission to both areas must be satisfied.

Admission of a candidate is for a particular year; if enrollment at that time is not possible, reapplication is necessary and will be considered on the same competitive basis as a new application. Exceptions must be approved by the Committee on Admissions and Degrees.

Application Deadlines Applicants may submit their completed applications and all supporting documentation by *November 1*, 1989. These early applications will be reviewed and acted on in November and December. Additional applications will be accepted through *February 1*, 1990, with action to be taken in February and March. Applications received from February 2 through May 1 will be accepted for consideration for programs that have not been filled in the November and February reviews.

Michelle Williams is focusing her doctoral research on perinatal and reproductive epidemiology.

Application, Supporting Documentation, and Application Fee In completing the application, it is important to refer both to this *Register* and to the detailed instructions accompanying the form. Applicants must submit the following application materials by the deadline date:

- A completed application form, application file card, and mailing labels
- Official transcripts of academic records at colleges, graduate schools, and/or professional schools, with certification of degrees conferred
- Letters of recommendation from at least three people who are well acquainted with the applicant's previous academic work and experience
- Scores of the Graduate Record Examination (GRE) or other standardized test, if applicable (see *Standardized Tests*, following)
- Scores of the Test of English as a Foreign Language (TOEFL), if applicable (see *International Students*, following)
- A nonrefundable application fee of $50 in the form of a check drawn on a bank in the United States, a postal money order, or an international money order payable to the Harvard School of Public Health

Applicants are responsible for assuring that the official transcripts, letters of recommendation, and test scores are received by the school. **All materials submitted become the property of the Harvard School of Public Health.**

Tuition Deposit Admitted applicants submit a $150 tuition deposit when confirming admission. This deposit is credited to the fall term bill and is not refunded if the student fails to register.

Policy of Nondiscrimination The policy of Harvard University is to make decisions concerning applicants, students, faculty, and staff on the basis of the individual's qualifications to contribute to Harvard's educational objectives and institutional needs. The principle of not discriminating against individuals on the basis of race, color, sex, sexual orientation, religion, age, national or ethnic origin, political beliefs, veteran status, or disability unrelated to job or course of study requirements is consistent with the purposes of a university and with the law. Harvard expects that those with whom it deals will comply with all applicable antidiscrimination laws.

Increasing numbers of students with disabilities are enrolling at Harvard and are participating in a wide range of programs and activities. Every effort is made to meet special needs. There are, however, no separate academic programs for either the physically handicapped or for students with learning disabilities; all enrolled students undertake the same program. At the Harvard School of Public Health, the Director of Student Affairs assists students with disabilities in adapting to life at the school.

STANDARDIZED TESTS

Applicants to the following programs are **required** to submit standardized test scores:

- **Department of Biostatistics** All applicants are required to submit scores from the GRE. Those with earned doctoral degrees may substitute scores from the Dental Admission Test (DAT), Graduate Management Admission Test (GMAT), or Medical College Admission Test (MCAT), as appropriate.
- **Department of Health Policy and Management** All applicants are required to submit scores from the GRE, DAT, GMAT, or MCAT, as appropriate to the applicant's background. Lawyers may substitute scores of the Law School Admission Test (LSAT) for the master's programs only.
- **Laboratory of Toxicology** All applicants are required to submit scores from the GRE.
- **Division of Biological Sciences** All applicants are required to submit scores from the GRE.
- **Department of Environmental Science and Physiology: Occupational Health Nursing** All applicants to this program are required to submit scores from the GRE.
- Applicants to all other programs who do not have a prior doctoral degree *at the time of application* are required to submit scores from the GRE. Applicants who find difficulty in arranging to take the GRE may request to substitute the DAT, GMAT, MCAT, or LSAT as appropriate to the applicant's background. The Admissions Office will ordinarily approve these requests, but may require the GRE for selected applications for which this test is felt to be more informative than other standardized tests.

Applicants with prior doctoral degrees who are applying to programs other than those listed above are not normally required to submit standardized test scores, although they are strongly urged to do so. Such applicants may be required to provide a recent GRE score if it is not possible to adequately assess the applicant's quantitative and analytic skills from the materials submitted. To avoid lengthy delays in the application process should this requirement be imposed, applicants with doctoral degrees are encouraged to take the GRE and to submit the test score with their application materials.

Applicants are advised to take the GRE (or other test, as appropriate) no later than the December test date, since applications will not be considered without the GRE score if required. When test scores are required, the school must receive an official score report from the Educational Testing Service before final action can be taken on an application. Scores may be no more than five years old.

Additional information concerning the standardized test requirement is included in the instructions accompanying the application form.

INTERNATIONAL STUDENTS

Language Proficiency Applicants from countries in which the language of instruction is not English must satisfy the Committee on Admissions and Degrees as to their ability to speak, read, write, and understand the English language. Only students who have shown evidence of academic excellence, who can understand rapid, idiomatic English, and who can speak, write, and read English with a high degree of facility should apply for admission.

Students are advised that they may be required to attend ten or more classes each week and to write papers and frequent short examinations. The school requires that all students maintain a minimum grade point average of 2.70 (B-) for graduation, and some programs have more restrictive standards. No allowance is made for students whose English is not sufficient for these demands; therefore, any deficiency must be made up before admission.

Test of English as a Foreign Language (TOEFL) All students applying from countries where English is not the language of instruction must submit scores for the TOEFL. The TOEFL score may be no more than two years old.

A TOEFL score of 550 or above is required for admission to a degree program. Applicants from abroad may be admitted to special student status with a TOEFL score of less than 550 (see *Special Students* under *Admission to Nondegree Status*, below). However, they may be advised to enroll in an English course while they are taking courses at the Harvard School of Public Health.

Applicants are advised to take the test no later than the November test date, since *applications will not be considered without the TOEFL score.* The TOEFL is administered six times a year at centers throughout the world. Information regarding registration, testing locations, and test administration dates may be obtained by writing to TOEFL Services, CN 6151, Princeton, NJ 08541-6601.

Financial Certification If admitted to the school, foreign nationals, whether residing in the United States or not, must provide certification of their financial resources before the immigration form needed to obtain a visa will be issued. International students must have sufficient funds available in United States currency to pay the expenses for the full period of their academic program, and show proof that they are permitted to exchange or export these funds.

In addition to providing this certification, international students wholly supported by personal funds, family funds, or sponsor's funds which are given directly to them are required to deposit certain amounts in the United States. Funds adequate to cover, at the minimum, the first semester's tuition, fees, and living expenses must be deposited in an escrow account in a bank in New York, NY or Boston, MA. It is recommended that funds adequate to cover the second semester's tuition, fees, and living expenses also be deposited in a bank account in the United States. Before the immigration form can be issued, an official letter stating the amount in United States dollars must be sent directly from the bank to the Admissions Office for each account.

An estimate of living expenses in the Boston area is included in the section *Expenses and Financial Aid*. International students should use the applicable estimate when calculating funds required for financial certification.

Academic Credentials The school must receive official transcripts of all academic records presented for admission. These transcripts must bear the institution's official seal, and be placed in a sealed envelope which is signed across the seal by the proper authority. For more information about this requirement, please refer to the instructions accompanying the application form.

Employment International students who hold an MD degree and either an F-1 or J-1 visa under the sponsorship of Harvard University are not permitted to accept any employment for which an MD degree is a prerequisite while in this country. For more information, contact the Harvard University International Office (telephone 617-495-2789).

Hospital Insurance All nonimmigrant students from abroad are required to enroll in the Harvard Blue Cross/Blue Shield student insurance plan. There can be no exception to this requirement. For more information about the plan, please refer to the section *Expenses and Financial Aid.*

ADMISSION TO NONDEGREE STATUS

Certain individuals are permitted, as a courtesy or by application, to study at the school while in nondegree status. The three categories of nondegree student are Harvard faculty and staff, Harvard affiliates, and special students. In each case, enrollment in courses is subject to the availability of space and the permission of the instructor; in courses with limited enrollment, preference is generally given to degree candidates. Payment in each case is not refundable and is due prior to or at the time of registration. Admission to nondegree status carries with it no commitment to accept the student as a degree candidate.

Harvard Faculty and Staff Persons holding Harvard Corporation appointments of at least half-time teaching faculty are permitted to enroll in courses at the school with the permission of the instructor and the registrar. Harvard staff should consult the Office of Human Resources about the provisions of the Harvard Tuition Assistance Plan. Harvard faculty and staff may take a maximum of five credit units per semester.

Harvard Affiliates Full-time employees of an institution affiliated with Harvard, and persons at Harvard University not covered in the preceding paragraph, who hold at least a bachelor's degree, may apply for affiliate status. Applicants admitted to affiliate status may take no more than five credit units per semester and ten credit units in total. Affiliates are not allowed to audit courses. Applications for admission to affiliate status can be obtained only by coming in person to the Admissions Office.

Special Students Procedures and requirements for the admission of special students are the same as for degree candidates, and in general, special student status is governed by the same policies that apply to all matriculated students. (Exception: At the discretion of the Committee on Admissions and Degrees, foreign students applying for degree candidacy may be admitted to special student status if their TOEFL is less than 550. These students may petition the Committee on Admissions and Degrees for reconsideration for degree candidacy upon receipt of a TOEFL of 550 or better.)

Applicants should specify on the application form the courses they plan to take. Special students are not allowed to audit courses. Those enrolled less than full time are not permitted to cross-register into other Harvard schools or MIT. Special student status is limited to one academic year. Special students who wish to be admitted to degree candidacy, other than the exception described in the preceding paragraph, must reapply and will be considered on the same basis as other applicants for admission.

Retroactive Credits Applicants to degree programs who have previously taken courses at the school while in nondegree status may, at the time of their application, petition to count up to ten credit units retroactively as part of the academic credit requirements. These courses must have been taken within three years of the date of entrance into the degree program and cannot be or have been counted toward any other degree at this school or at any other school. Applicants who were cross-registered at the Harvard School of Public Health while enrolled at another Harvard-affiliated school must include with their petition an official transcript from the other school as well as a letter from that school's registrar stating that the courses taken at the School of Public Health have not been counted toward a degree. A request for retroactive degree credit must be approved by the department or program with which the student is affiliated and by the Committee on Admissions and Degrees. Permission may be granted if the courses fit into the applicant's academic program. Tuition credit will not be given for previous course work, and students are expected to meet full tuition requirements for the degree.

■ REGISTRATION

ACADEMIC YEAR

The academic year at the Harvard School of Public Health is divided into two semesters. The fall semester begins in mid-September and the spring semester begins in late January. Each semester is divided into two periods: "a" and "b" in the fall, and "c" and "d" in the spring. Between the semesters, in January, a week of field work and special projects is called "e" period. There is a similar period during March recess called "f" period. The Program in Clinical Effectiveness offers its students courses during an eight-week summer period referred to as "s" period. The *Academic Calendar,* which gives term dates, recess periods, holidays, and so forth, is printed in the front of this *Register.*

REGISTRATION PROCEDURES

Every degree candidate is expected to register until the requirements for the degree are fulfilled or until degree candidacy is terminated. Every resident student, whether full time or half time, must register in person at the beginning of each semester.

Fall registration is held during the week prior to the first day of classes. Registration dates and deadlines for fall and spring semesters are listed in the *Academic Calendar* in the front of this *Register.* Students cross-registering into other schools must meet the deadlines set by *both* the School of Public Health and the school offering the course. A fee of $35 per week is charged for late registration.

To complete registration, each student must file a study card with the Registrar's Office. Study cards must be submitted in person and may not be submitted by persons other than the student without special permission from the registrar. Students who wish to take courses jointly offered by the School of Public Health and other Harvard schools must register for these courses at the School of Public Health. Students who wish to cross-register for a course offered by another school must obtain a cross-registration petition from the Registrar's Office at the School of Public Health and take it to the registrar's office of the school offering the course.

Mary Ann Sprauer, MPH '88 (left), shares her HSPH experiences with Judith Hull, Registrar and Director of Admissions.

INTERNATIONAL STUDENTS

All international students must report to the Harvard International Office, 1350 Massachusetts Avenue, Cambridge, MA, at the beginning of their first semester at the school. There they must present their passports and entry permits or other evidence of their immigration status. This requirement applies to all students who hold an F-1 student visa, a J-1 exchange visitor visa, or permanent resident status.

COURSE LOAD REQUIREMENTS

Full-Time Students Students must take a minimum of 40 credit units for the year to be registered as full time. Students normally take 20 credit units per semester.

However, a full-time student may take a minimum of 15 units in a semester, with a minimum of 5 units in any one period, and may register for a maximum of 25 units per semester. To take more than 25 units in a semester, a student must submit a petition to the Committee on Admissions and Degrees at the time he or she files the study card. Full-time students who take more than 40 units in a year are not charged additional tuition.

Students in the two-year, 80-unit Master of Science program must take a minimum of 40 units in the first year and 35 units in the second year. Students who take more than 40 units in the first year may carry over only 5 units into the second year. In other words, the 80-unit requirement may be met by taking 45 units the first year and 35 the second year.

Students who are accepted into two consecutive one-year programs (40 credit units each) and who are awarded one degree at the end of the first year must fulfill the requirements for a one-year (40-unit) program during the second year. Credit units may not be carried over from the first program into the second. Persons in a 60-unit master's degree program must follow the guidelines for students in an 80-unit degree program, except that all 60 units must be taken within three consecutive semesters.

Half-Time Students Half-time students generally complete a one-year program in two academic years. A regular program for half-time students consists of 10 credit units per semester, although they may register for a minimum of 7.5 and a maximum of 12.5 units per semester for a total of 20 units per year. Units over 25 per year are assessed an additional tuition charge of $320 per unit; tuition paid for units over 25 per year may not be applied toward total tuition requirements (see *Expenses and Financial Aid*). Half-time students wishing to take more than 25 units per year must petition the Committee on Admissions and Degrees for approval, in addition to paying extra tuition for the additional units.

Part-Time Students The Committee on Admissions and Degrees occasionally permits students to register as part-time degree candidates. These students must complete a two-year, 80-unit program in three academic years; ordinarily, this requires at least half-time attendance. Tuition is charged at the full-time rate for the first year and at the half-time rate for the following two years. Students in a two-year program desiring any other credit unit/program arrangements must submit a petition to the Committee on Admissions and Degrees for approval.

■ EXPENSES

TUITION AND FEES FOR 1989–90

Degree Candidates	
Full-time resident tuition	$12,975*
Half-time resident tuition (up to 25 credit units per year) (Credits over 25 will be charged $320 per credit.)	6,720*
Doctoral full-time reduced tuition	6,720*
Doctoral half-time reduced tuition	3,595*
Doctoral facilities fee (resident)	2,025*
Nonresident doctoral fee (less than half-time)	785
Leave of Absence	
Active file fee for each semester student is on leave	125
Special Students	
Enrolled for 10 or more credit units: Tuition as stated above for full-time or half-time attendance.	
Enrolled for 6 to 9 credit units:	
First credit unit of work per semester	560*
Each additional credit unit of work per semester	320
Enrolled for 1 to 5 credit units:	
Per credit unit of work per semester	320
Summer Session (1990)	
Five credit unit summer program for degree candidates who register and receive credit for research or supervised study during summer session	1,575
Dissertation Fee	
Final doctoral tuition fee. For the semester in which a dissertation is formally approved and accepted by the department and the Committee on Admissions and Degrees, a doctoral degree candidate must have paid at least this amount.	515
Medical Insurance	
Blue Cross/Blue Shield is billed separately. This is compulsory for nonimmigrant foreign students.	561**
Late Fees	
Late registration fee	35
Late study card fee	35/ week
Drop/Add Fee	
After published deadlines: per CAD petition	40

* These amounts include the **unwaivable** University Health Services fee.

** Health insurance is **required** for all international students. Family health insurance is available for all students at an additional cost of between $2,156 and $3,510 per year, depending on family size.

FINANCIAL CLEARANCE

Degree Candidates The filing of a study card is necessary to complete registration. The Registrar's Office will not officially register a student who is not financially clear. To be considered financially clear, students must pay all past charges due the university and must take one of the following actions toward payment of the current semester's tuition and fees:

- Pay the current semester's charges in full.
- Enroll in the monthly payment plan. This allows students to pay one-quarter of the semester's charges at the time of registration and to spread the rest of the payments over the next three months. Students can sign up for the plan at the Student Billing Office, Holyoke Center fifth floor, Cambridge. The fee for this service is $25 per semester.
- Obtain documentation from the school's Financial Aid Office that loans are in process which will cover the semester's full tuition and fees. Students with loans pending are allowed to register conditionally until the loan acceptances are available for signature.
- Provide documentation that tuition and fees are being directly billed to and will be paid by a sponsoring organization.

Any student whose indebtedness to the university remains unpaid on the date fixed for payment may be deprived of the privileges of the university. Reinstatement is obtained only by consent of the Associate Dean for Students at the School of Public Health.

Nondegree Students Harvard faculty and staff, Harvard affiliates, and special students enrolled for less than 10 credits must pay all tuition and fees for the semester in full when they register. Payment is not refundable.

Billing Address Term bills are sent to a student's local address unless the Student Billing Office is requested in writing to send them elsewhere.

TUITION REQUIREMENTS

After admission to the Harvard School of Public Health (HSPH) and until fulfillment of the requirements for the degree, all degree candidates must be registered continuously in one of the following registration categories:

- Resident students
- Nonresident doctoral students
- Students on leave of absence

Degree candidates must pay full tuition for a designated number of years, depending on their degree program and their previous affiliation with the school. All degree candidates must pay the appropriate tuition rate for each registration period as outlined on the *Tuition and Fees* schedule; tuition may not be paid on a "per credit" basis, except for half-time degree candidates who take over 25 credit units for the year. Any degree candidate who registers for less than full time must in any event fulfill the full-time, full-tuition requirements for the degree. Tuition for summer school courses and additional tuition paid by half-time degree candidates for credits over 25 per year may not be credited toward any tuition requirements for the degree.

Resident Students All degree candidates who are enrolled in courses or who intend to use any Harvard academic facilities must register as resident students. *Master's degree students* pay full tuition for the entire period in which they are in full-time attendance.

The tuition requirements for resident *doctoral students* are as follows:

1. Students who have received a one-year master's degree from HSPH within three years of enrolling in a doctoral program in the same discipline pay a minimum of one year of full tuition and one year of reduced doctoral tuition.

2. Students who have received a two-year master's degree from HSPH within three years of enrolling in a doctoral program in the same discipline pay a minimum of one year of reduced doctoral tuition.

3. Students who have received a Master of Public Health degree and a Master of Science degree from HSPH within three years of enrolling in a doctoral program in the same discipline as one of their HSPH master's degrees pay a minimum of one year of reduced doctoral tuition.

4. Students who have not previously attended HSPH pay a minimum of two years of full tuition and one year of reduced doctoral tuition.

5. In the year(s) following the year in which reduced doctoral tuition is paid, students pay only the facilities fee. This fee enables students to use Harvard academic facilities and the University Health Services.

Nonresident Doctoral Students Doctoral students who no longer reside within a 50-mile radius of Boston, who are engaged in less than half-time work on the degree, and who have received permission from their department and the Committee on Admissions and Degrees (CAD) to pursue a portion of their program as a nonresident, are charged the nonresident doctoral fee. Students in this category normally have completed payment of at least the required two years of full-time tuition and one year of reduced doctoral tuition before applying for nonresident status; they must in any case complete this payment prior to their graduation and will be billed accordingly while in nonresident status.

The nonresident doctoral fee covers periodic consultation with the student's doctoral adviser but does not provide for the use of Harvard facilities or for the issuance of a Harvard identification card. Also, students registered for less than a half-time program may not qualify for deferment of an educational loan. Upon expiration (or earlier termination) of CAD permission for nonresident status, or for a term in which use of Harvard facilities is required, the appropriate resident rate will be charged.

Students on Leave of Absence Degree candidates who will not, during a given registration period, be engaged in study or research for a degree from the school, and who will be making no use of Harvard facilities, must apply for a leave of absence. The application should be made prior to the registration period for the semester during which the leave of absence would begin. Students on leave of absence are required to pay the active file fee to maintain their degree candidacy. Upon expiration or earlier termination of the leave of absence, students are charged the appropriate tuition rate.

STUDENT HEALTH INSURANCE

University Health Services University Health Services (UHS) provides comprehensive prepaid medical care such as physical examinations, physician visits, laboratory tests, and psychological counseling. Students may establish a relationship with a particular UHS physician and may use the drop-in clinic for acute medical and surgical situations. Payment of the University Health Services fee is compulsory for all students enrolled for at least 6 credit units per semester.

Blue Cross/Blue Shield The Blue Cross/Blue Shield (BC/BS) medical insurance plan, charged separately from the University Health Services fee, covers the costs of many types of medical care not offered at University Health Services. Students may enroll in the plan in September or January, and coverage extends through August 31. A descriptive brochure about the BC/BS plan is included with the fall registration materials.

Students are automatically enrolled in the BC/BS plan. This insurance is compulsory for all nonimmigrant students from abroad. It is also required for all other students who do not have comparable insurance.

United States students who have comparable medical insurance and who would prefer not to enroll in BC/BS must submit a waiver form by August 18 (for the fall semester) or January 17 (for the spring semester). *Students who fail to file waivers will be responsible for any fees billed for that semester.* Waivers for BC/BS insurance are approved *only* by the Director of the University Health Services.

Nonresident doctoral students are not automatically enrolled in any Harvard health plan. Those who wish to have BC/BS insurance coverage must file special forms with the Harvard Student Insurance Office by August 18 (for the fall semester) or January 17 (for the spring semester). Coverage is optional for students who are residing outside the United States. However, BC/BS insurance is mandatory for all international students in nonresident status *within* the United States.

A BC/BS/UHS plan for spouses (including maternity benefits) and children of full-time students is also available. As the plan provides extensive benefits for ambulatory and inpatient care, all who are eligible are strongly advised to enroll.

FIELD STUDIES

Field opportunities, listed under each department's course offerings and bearing the course number 330, often entail travel expenses that must be met by the student. Information about estimated expenses should be obtained from the appropriate department.

Hanna Hastings, Director of Student Affairs, works closely with officers of the student government and with student groups such as the Committee for the Underrepresented.

LIVING EXPENSES

Living costs in the Boston area are higher than in many other parts of the United States. The table below lists estimated amounts that students will need in the academic year 1989–90 to cover expenses for nine months. Applicants who plan to enroll in a two-year program should allow for a four to six percent increase for the academic year 1990–91.

Harvard School of Public Health
Estimated Expenses for the 1989–90 Academic Year
(calculated for 9 months)

	Single	*Married*	*Married/Children*
Tuition	$12,975	$12,975	$12,975
Books/Supplies	725	725	725
Student Health Insurance	561	561	561
Rent/Utilities	6,784	7,650	Increase living
Food	2,365	4,700	expenses by $ 3,500
Personal	2,750	5,500	per child
Transportation	770	1,000	
Total	**$26,930**	**$33,111**	**$36,611**

Notes:
- Applicants should keep in mind that these figures are only estimates and may not reflect individual lifestyles.
- International students should plan on an additional 10% for possible decreases in currency exchange rates.
- Students from warmer climates should consider the added expense of winter clothing (about $400 per person).
- The purchase of furniture and household items has not been included.
- Financial aid recipients can only be funded for their own expenses. It is assumed that the expenses of the spouse (and children) are covered by the spouse's income. Special consideration is made for single students with dependents.
- In addition to books, some courses require the purchase of photocopied articles and other materials. There is also a charge for photocopies made by the student.
- Student health insurance is available through Massachusetts Blue Cross/Blue Shield and is required for all international students and for others who are not covered by another health insurance plan. Blue Cross/Blue Shield family health insurance with University Health Services coverage is available through Harvard at an additional cost of between $2,156 and $3,510 per year, depending on family size.
- Rents in Boston may be substantially higher than where an applicant is coming from. Because of the influx of students, apartments can be difficult and expensive to locate for September. Students often find they must use the services of rental agents who charge up to one month's rent. It is standard practice to pay first and last months' rent plus a security deposit.
- Transportation is generally considered the cost of using public transportation and excludes relocation costs and car expenses.

■ FINANCIAL AID

SOURCES OF FINANCIAL AID

Financial aid at the Harvard School of Public Health is generally available only to United States citizens and permanent residents, since most of the funding is from federal sources. United States citizens and permanent residents are eligible to apply for grants, loans, and work-study programs.

Grants for United States Citizens and Permanent Residents Some departments have training grants that may provide up to full tuition and a stipend. Eligibility for these grants is based on career goals, merit, and/or financial need. Applicants should contact the administrator of the department to which they seek admission for further information on available departmental grants.

Full-time students who do not receive grant support from a department and who have demonstrated financial need may be eligible for school grants administered by the Financial Aid Office. In the past, these general school funds have been available to provide a limited number of grants ranging from partial to full tuition. Several full-tuition grants are reserved for incoming minority students.

Grants for International Students Very little funding is available for international students. Most financial aid available throughout the school comes from the United States federal government and is restricted to citizens and permanent residents of the United States. A maximum of four full-tuition grants may be available for incoming international students. Applicants must be nominated by their department for consideration by the Financial Aid Committee. If nominated, international students are asked to provide verification of their need for fi-

nancial assistance. Interested applicants should contact their department chairman for information and submit the Application for Financial Assistance. Only those nominated will be sent a response to their application. Recipients are chosen by the end of May.

Since school funds are extremely limited for international students, other arrangements should be made to bring sufficient funds to cover tuition and living expenses. The School of Public Health must have official certification of the source and amount of financial support for an international student's academic program before the immigration form needed to obtain a visa can be issued.

College Work-Study Program (for US citizens and permanent residents) College Work-Study is a federally funded program which provides eligible students with financial support to facilitate obtaining employment in public and private organizations. Students are given earnings allocations; 70% of the earnings are paid by Work-Study and 30% are paid by the employer. Eligibility is based on financial need, full-time status, and availability of funds.

Scholarships Throughout the year, various scholarships may become available through university and outside sources. Some examples are scholarships for Massachusetts, Rhode Island, and Delaware residents; the Pforzheimer Fellowship for graduates of Harvard/Radcliffe College with interests in public service; and the Kennedy, Knox, and Sheldon Traveling Fellowships. Students should contact the Financial Aid Office for additional information.

Loans Loans have increasingly become a major source of support for Harvard School of Public Health students. United States citizens and permanent residents may be eligible for the following loans:

■ Stafford (formerly Guaranteed Student Loan)

INTEREST RATE: Currently 8% for first four years of repayment, 10% thereafter; previous borrowers may have 7%, 8%, or 9% rates that remain constant
SUBSIDIZED INTEREST: Yes; by federal government while student enrolled full time and during grace periods (6 or 9 months after graduation)
FEES: 5% origination fee; insurance fee varies with guarantee state
ANNUAL LIMIT: $7,500
AGGREGATE MAXIMUM: $54,750
ELIGIBILITY: Determined by Financial Aid Office; based on financial need
SOURCE: Harvard University or outside lender

■ Supplemental Loan for Students (SLS)

INTEREST RATE: Variable with cap of 12%
SUBSIDIZED INTEREST: No; interest may be paid monthly or capitalized
FEES: About 2%
ANNUAL LIMIT: $4,000
AGGREGATE MAXIMUM: $20,000 (includes PLUS loans)
ELIGIBILITY: Initially determined by Financial Aid Office; credit review by lenders
SOURCE: Harvard University or outside lender

■ Perkins Loan

INTEREST RATE: 5%
SUBSIDIZED INTEREST: Yes; similar to Stafford
FEES: None
ANNUAL LIMIT: Determined by Financial Aid Office; maximum is generally $4,000 since funds are limited
AGGREGATE MAXIMUM: $18,000
ELIGIBILITY: Determined by Financial Aid Office; based on financial need
SOURCE: Harvard University

■ Health Education Assistance Loan (HEAL)

INTEREST RATE: Variable
SUBSIDIZED INTEREST: No
FEES: About 7%
ANNUAL LIMIT: $12,500
AGGREGATE MAXIMUM: $50,000
ELIGIBILITY: Initially determined by Financial Aid Office; credit review by lenders
SOURCE: Outside lenders; BayBank/Boston applications available from Financial Aid Office

■ SHARE/GRADSHARE Loan

INTEREST RATE: Variable or fixed
SUBSIDIZED INTEREST: No
FEES: About 4%
ANNUAL LIMIT: $15,000 for SHARE; $7,500 for GRADSHARE
AGGREGATE MAXIMUM: $33,000
ELIGIBILITY: Credit worthiness; review of debt/income ratio for SHARE
SOURCE: Nellie Mae (1-800-EDU-LOAN); applications also available from Financial Aid Office

The School of Public Health has no established limits on aggregate loan debt, separate from program limits. Students are advised to consider several factors when accumulating loan debt:

- Anticipated salary upon graduation: education loan repayment should not exceed 15% of gross monthly salary
- Effects of loan debt on future eligibility for credit
- Seriousness of loan defaults
- Future financial goals

APPLYING FOR FINANCIAL AID

Candidates applying to departments with training grants should consult with the departments on procedures for applying for these grants. Candidates who will be attending full time and who would like to be considered for general school funds, as well as anyone interested in applying for loans or for College Work-Study, must submit the following materials to the Financial Aid Office, Harvard School of Public Health, Room G-4G, 677 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1867):

- HSPH Application for Financial Assistance for 1990–91
- Completed and processed Financial Aid Form (FAF) for 1990–91 (available on request from the Financial Aid Office)
- A copy of 1989 federal income tax return
- A copy of alien registration card for permanent residents

Deadlines Applicants are advised to submit the HSPH Application for Financial Assistance, requesting the FAF, as early as possible, since the FAF takes four to six weeks to be processed. Before applicants can be reviewed for aid they must be admitted to the school, and the Financial Aid Office must have received the HSPH Application for Financial Assistance, the processed FAF, and a copy of the alien registration card (for permanent residents). A preliminary review can be made without a copy of the tax form, but the form should be sent as soon as possible.

The **deadline** for applying for grants is **March 15, 1990.** Financial aid applications will be accepted after March 15, but since **funds are very limited** grants may no longer be available. Applications for loans may be submitted at any time.

Notification of grant awards usually begins in early April.

POLICIES

Contingencies Retention of awards and loans is contingent upon making satisfactory academic progress (the maintenance of at least the minimal acceptable grade point average and the required number of credit units).

Education Loan Defaults Applicants should be aware that the Harvard School of Public Health views the issue of defaulted education loans as a very serious matter. According to federal regulations, students in default are ineligible to borrow through any federal education loan program or to participate in the College Work-Study Program. Students are also ineligible to receive any institutional support from the Harvard School of Public Health.

Policy of Nondiscrimination The policy of nondiscrimination described under *Admission* holds for financial aid decisions as well.

COURSES OF INSTRUCTION

In the course listings, course numbers from 100 to 199 indicate undergraduate and graduate courses; numbers from 200 to 299 indicate primarily graduate courses; and numbers from 300 to 399 indicate graduate courses of reading and research.

The letters "a," "b," "c," "d," "e," "f," and "s" following the course number indicate the period(s) in which a course is given, with "a" denoting first period and "b," second period (fall); "c," third period and "d," fourth period (spring). The letters "e" and "f" indicate supervised special studies or field observations, usually during the one-week period between fall and spring semesters or during the week of spring recess. The letter "s" indicates courses offered in the summer as a part of the Program in Clinical Effectiveness.

The credit assignment is given in units following the statement of number and length of sessions per week. Credit units are assigned on the basis of the total amount of time required by a course, both class time and outside preparation. For example, a full-semester ("ab" or "cd") 5-unit course normally requires 8 to 12 hours of outside effort each week, while a full-semester 2.5-unit course normally requires 4 to 6 hours of outside effort.

Course titles in bold type are often followed by titles and numbers in roman face (enclosed in parentheses). This indicates that the course is also listed in other Harvard catalogs, such as Arts and Sciences, and that the course credit is provided through that faculty as well as through the School of Public Health, e.g., **POP 209ab** (Biology 195).

Every effort is made to ensure that the following list of courses is complete and accurate at the time of publication. However, the school reserves the right to make changes in the courses, instructors, and requirements announced in this *Register.*

The listing of courses in this *Register* implies no guarantee that a student will in fact be able to enroll in all courses of interest to that student. The course schedule is arranged insofar as possible to accommodate school and departmental requirements. However, students may encounter scheduling conflicts, particularly with electives and with courses offered in other faculties. Students should also be aware that they must satisfy any prerequisites listed in a course description before they will be permitted to enroll in that course. Courses may be dropped from the schedule at the discretion of the instructor if less than five students enroll.

■ INTERDEPARTMENTAL COURSES

ID 201cd. Biology, Epidemiology, Economics, and Policy (BEEP): Malaria
Lectures, seminars. *One 3-hour session each week. 2.5 units.* Dr. David.
This course is designed to bring a multidisciplinary approach to a major public health problem in international health. Within the context of the biology and epidemiology of malaria, students are exposed to strategies of vector control, chemotherapy, and vaccines from the point of view of social, political, and economic policy. Impacts of programs are evaluated from an international local perspective utilizing techniques from both the social and biomedical sciences.

ID 203ab. Seminars on Surveillance
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Monson, Dr. Halperin, Guest Lecturers.
Surveillance is the ongoing and routine collection, analysis, and use of health data for the purposes of disease prevention, early detection of epidemics, and formulation of plans to control epidemic and endemic diseases. Design, maintenance, and evaluation of such programs are usual activities for health officers. This seminar series addresses important issues for surveillance of infectious and man-made diseases, including case definition, protection of privacy, compliance of physicians with reporting requirements, and applications to the design of control programs.

ID 208d. Transformation of the Health Sector in South Africa: Obstacles and Possibilities
Lectures. *One 2-hour session each week. 1.25 units.* Dr. Cash.
Examines the health sector in South Africa in terms of the prevailing sociopolitical environment, including the government's plans to privatize large parts of the racially based health service and the call of the academic and popular communities for a national health service. By focussing on key topics, students develop an understanding of the obstacles that face a reorientation of the health sector toward a nonracial and democratic society, and generate ideas on desirable, appropriate, and feasible possibilities for such an orientation.

ID 209a. Health Services in Developing Countries
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Cash, Guest Lecturers.
Provides a broad overview of health and health care problems in developing countries. Central issues include ecologic, environmental, and other characteristics of developing countries affecting health; analysis of their health problems, the alternative approaches to solving them, the policy and planning issues in applying solutions, and the organizational alternatives for utilizing health resources; the nature, composition, and training of the health team for use at the local and district levels; and the relation of health to development and the position of health in national planning priorities. Case studies are used extensively with student teams proposing solutions to the problems.
Preference is given to students who have previously been involved in international health activities.

ID 210c, ID 210d. Introduction to Educational Design in Health Fields
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Vanderschmidt, Dr. Koch-Weser, Dr. Segall.
An introductory course designed for students preparing for careers in the education of health professionals. Provides a systematic approach to instructional design through a model program which includes analysis of professional responsibilities and performance, specification of educational objectives, design of instructional activities, and evaluation of the educational process and outcome. Students apply the model to the development of a segment of instruction in areas of individual interest. Examples are drawn primarily from the fields of public health and community-oriented primary care. During the "c" period, students may elect to take the course on a self-instructional basis by agreement of the instructors. The course is repeated during the "d" period on a self-instructional basis *only.*

ID 211d. Vaccines: Past, Present, and Future
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Essex, Dr. Walsh.
Covers methodology for new vaccine development, human trials, manufacturing and quality control, techniques to ensure appropriate use of vaccines, liability issues, cost-effectiveness analysis, and decision analysis regarding vaccines for future research, development, and distribution.

ID 212c. Biomedical Writing
Seminars. *One 2-hour session each week. 2 units.* Dr. Chernin.
Writing scientific papers is an integral part of the research process. This course develops practical skills and experience in planning and writing articles that meet the editorial demands of biomedical journals. The salient elements of a well-prepared article—logical organization, clear and concise scientific prose, and understandable tables and figures—are emphasized by criticizing short papers written by the participants on biomedical subjects of their own choice.
Enrollment is limited to 10 students and requires the approval of the instructor at least two weeks before the course begins. This course is given pass/fail.

ID 214c. Cultural Dimensions of International Health: Practical Applications for Health Planning
Lectures, case studies. *Two 2-hour sessions each week. 2.5 units.* Dr. Weiss (Harvard Medical School).
Introduces students to the important and complex effects of culture on health and health care. Develops a systematic method to guide planners in designing culturally informed health services. Considers how the local and larger cultural contexts mediate the effects of power relationships and political and economic forces that affect health and health care.

ID 216cd. Health Aspects of Nuclear Weapons and War (HMSC-PMCE 709)
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Forrow, Dr. Leaf, Dr. Leaning, Dr. McArdle, and other medical area faculty.
Introduces students to the health aspects of the production and potential use of nuclear weapons, including the responsibilities of health professionals in the development of public policy. Course topics include historical background, basic physics of nuclear weapons, biological and ecological effects of radiation, nuclear weapons production cycle, medical and psychosocial effects of nuclear war, civil defense, and the roles of health professionals. Related issues concerning chemical and biological weapons are also discussed. Each student leads a classroom discussion of a specific issue.

ID 217cd. Capitalism, Socialism, and Public Health
To be given 1989–90; offered alternate years.
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Lewontin, Dr. Levins, Visiting Lecturers.
Contrasts the analysis of problems in public health, nutrition, and population by Marxist and capitalistic social and economic theories. Topics include Marxist economics and social theory, population control, "green revolution," nutrition planning, maternal and child health, and occupational health.

ID 220cd. Workshop: The Design and Management of Development Programs and Projects (KSG S-562)
Seminar. *Two 1½-hour sessions each week. 5 units.* Dr. Thomas (John F. Kennedy School of Government).
Draws heavily on students' own experience and working knowledge of analytical techniques. Attempts to synthesize practical and educational experience to provide the student with a stronger set of skills for future participation in development programs. Emphasizes both the analysis of issues from a political economy perspective and the practical skills of group work, negotiation, memo writing, and verbal presentation in simulated practical situations. Students are expected to have prior experience in and career commitment to the field of development.
Enrollment is subject to the approval of the instructor.

ID 222d. The AIDS Epidemic: Status, Dynamics, Prospects, Conflicts
Lectures, discussions. *One 2-hour session each week. 1.25 units.* Dr. Essex.
Deals with a broad range of topics relating to the public health implications of the AIDS epidemic, including the virology, therapy, and etiologic hypotheses concerning the origins of the virus. Topics for discussion and review include the dynamics of the epidemic, public policy issues relevant to measures to reduce the spread of infection, economic implications, and social support needs of affected persons.
Prereq. MD degree or demonstrated knowledge of virology, molecular biology, or animal biology, or permission of the instructor.

ID 230b. Health of Community Populations
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Gortmaker, Dr. Wise, Guest Lecturers.
Principally targeted for those with interests in biostatistics, epidemiology, health policy, and management. Focuses on the common diseases particularly affecting persons living in poverty or near poverty conditions in urban America. Discusses the impact of socioeconomic, cultural, and environmental factors upon ill health. Provides an overview of the types of data available from which to identify community health problems. Presents and evaluates case studies from local communities.
Prereq. BIO 200ab or BIO 201ab.

ID 330f. Field Trip
Three-day period between "c" and "d" periods. 1 unit. Instructor to be Announced. *Centers for Disease Control, Atlanta, Georgia.*
The Centers for Disease Control (CDC) is a unique institution with many public health functions relevant to the educational and research interests of domestic and foreign students. This field trip will give students an overview of the activities of the CDC, as well as an opportunity to meet individually with professional staff. Lectures and tutorials relate to the various disciplines at CDC, including occupational diseases, surveillance systems, epidemiology, control measures for both chronic and infectious diseases, and CDC's role in international health. Other topics are arranged depending on the interests of the group. A brief paper on the material covered is required of each student.

■ BEHAVIORAL SCIENCES

BEH 201a. Health and Behavior I
Seminars, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Gortmaker.
Focuses on the contribution of behavior to health status and includes an examination of individual, institutional, and community health related actions and decisions. Introduces program planning models to enable healthful change.
Course instructors are Dr. Daltroy and Dr. Rudd.

BEH 202b. Health and Behavior II
Seminars, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Gortmaker.
Focuses on psychosocial, educational, and development theories and the design of theory-based health education strategies for change. Course structure emphasizes experiential learning, and content reflects innovative national as well as international programs.
Course instructors are Dr. Rudd and Dr. Daltroy.

BEH 205cd. Behavioral Sciences in International Perspective
Seminars, lectures. *One 2-hour session each week. 2.5 units.* Dr. Pierce.
Offers a survey of various behavioral sciences theories and practices. The aim is to demonstrate how such information can be modified for application to health problems which are common to human society, regardless of locality. Readings, seminars, lectures, discussions, and written assignments cover three broad areas: health, communication, and cooperation.

MCH-BEH 210ab. An Introduction to Personality and Cognitive Development
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. D. Walker.
Not given 1989–90.
(Course described under Maternal and Child Health.)

BEH 211c. Mass Communications and Public Health
Seminars, case studies, lectures. *One 1½-hour session each week, two full-day trips. 2.5 units.* Dr. Gortmaker, Dr. Schwartz.
Covers the theory of communications, creation of radio and TV advertising, research and polling, media buying, contextural uses of media, media and political strategy, public relations, and lobbying. Students spend two weekends in a New York studio, with Tony Schwartz, producing health-promotion commercials. Lectures in Boston are via teleconference with the studio in New York.
Preference is given to students in the Department of Behavioral Sciences. Class enrollment is limited to 15. Application forms must be filed four weeks prior to the start of the course.

BEH 212d. Health Promotion Through the Mass Media
Lectures, consultations. *One 1½-hour session each week plus one ½-hour consultation with student work groups. 2.5 units.* Dr. Gortmaker, Dr. DeJong.
Covers the development of public communication campaigns in the field of health promotion, including social marketing: What the mass media can accomplish to promote health; designing educational materials that are consonant with principles of behavioral science; conducting formative research; executing an integrated mass media campaign.
Prereq. Limited to 20 students; preference is given to students in Behavioral Sciences and students who have completed BEH 211c.

BEH 214d. Behavior/Lifestyle Change and Risk Factor Alteration: Introduction to Methods and Process
Lectures, discussions. *One 3-hour session each week. 2.5 units.* Dr. Gortmaker, Dr. Benfari.
Focuses on designing and implementing a health intervention program. Topics include training staff, developing objectives, developing competencies in behavioral techniques, understanding the therapeutic alliance, and the evaluation of selected primary prevention programs. Methods include readings, group discussions, cases, and films.

BEH 215c. Inducing Social Change
Lectures. *Two 1½-hour sessions each week. 2.5 units.* Dr. Mertens.
Designed for specialists in public health who are charged with responsibility for introducing changes in organizations and communities. Includes methods and theories of teaching, principles of individual and group psychotherapy, approaches to sensitivity training and group dynamics, and organizational theory. Techniques and procedures illustrating these theories are presented through readings, discussions, and case illustrations.

BEH 216cd. Case Studies in Health Promotion
Case studies. *One 2-hour session each week. 2.5 units.* Dr. Cleary.
Examines health promotion/education interventions in the US and discusses applications in developing nations. Students work in groups to develop health promotion proposals. Applies basic social science principles.

BEH 220cd. An Introduction to Pathological Behaviors: Epidemiology, Prevention, Treatment, and Public Policy
Seminars. *Two 1½-hour sessions each week. 5 units.* Dr. Wechsler.
Examines pathological and pathogenic behaviors from the public health perspective. Focuses on epidemiology, etiology, treatment, prevention, and public policy approaches to mental illness, alcoholism, suicide, drug abuse, eating disorders, AIDS, teen pregnancy, smoking, gambling, obesity, violent behavior, and accidents.

BEH 221c. Mental Health Factors in Organizations and Industry
Lectures, readings, case illustrations. *One 2-hour session each week. 2.5 units.* Dr. Mertens.
Covers psychological well-being of entire organizations, interpersonal conflict, psychological causes of industrial accidents, industrial and organizational stress, and the organization of psychological units in industry.

BEH 222c. Alcoholism and Alcohol Abuse
Seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Wechsler.
Covers the nature and scope of alcoholism and alcohol abuse. Topics include medical and biological aspects, diagnosis, patterns of use and abuse in the general population and among special groups, international patterns of use and abuse, treatment, employee assistance programs, family factors, alcoholism and the primary care physician, drinking and driving, social supports of drinking, prevention, and public policy.

BEH 223d. Drug Addiction and Drug Abuse
Seminars, discussions. *Two 1½-hour sessions each week. 2.5 units.* Dr. Gortmaker.
Covers the prevalence of drug addiction and abuse. Topics include epidemiology, effects on health, etiology, prevention and treatment, and public policy.
Course instructor is Dr. McAuliffe.

BEH 230cd. Social and Behavioral Research Methods
Seminars. *Two 1½-hour sessions each week. 5 units.* Dr. Gortmaker.
Covers aspects of behavioral research methods, including research design, measurement, sampling, data collection, and data analysis. By case studies, methodological readings, and discussion, students learn the conduct and critical evaluation of experiments, surveys, measurement construction, longitudinal research, observational studies, and the use of structural equation models.
Prereq. BIO 200ab or BIO 201ab. A multivariate statistics course is strongly recommended.

BEH 300abcde. Tutorial Programs
Time and credit to be arranged.
Arrangements may be made with individual instructors to give a reading course on topics not covered in the department's course offerings.

BEH 350. Research Training
Training in research is available for doctoral candidates through individual arrangements with the members of the department.

■ BIOSTATISTICS

BIO 112a, 112b. Computing Principles and Methods I
Lectures, discussions. *Two 1½-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 2.5 units each period.* Dr. Pagano, Dr. Fenton, Ms. McFadden.
Introductory course designed to provide basic computer literacy to students from all disciplines. Topics include computer terminology; organization, capabilities, and limitations of computers; data collection methods; programming principles; database management systems; telecommunications; and data analysis software. Credit is given for only one section of BIO 112: a, b, or e.

BIO 112e. Computing Principles and Methods I
Lectures, discussions. *Four 2-hour sessions.*
Laboratory. *Two 2-hour sessions. 1.25 units.* Dr. Pagano, Dr. Hunt.
Introductory course designed to provide basic computer literacy to students from all disciplines. Topics include computer terminology; organization, capabilities, and limitations of computers; data collection methods; database management systems; telecommunications; and artificial intelligence in medicine.
Credit is given for only one section of BIO 112: a, b, or e.

BIO 113b. Computing Principles and Methods II
Not given 1989–90.
Lectures, discussions. *Two 1½-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 2.5 units.* Dr. Pagano, Dr. El Lozy.
A practical introduction to the principles of programming using the high-level language C.
Prereq. BIO 112 or equivalent.

BIO 200ab. Introduction to Statistical Methods
Lectures, discussions. *Two 1½-hour sessions each week.*
Laboratory. *One 1-hour session each week. 5 units.* Dr. Amato, Dr. Gonin.
Covers basic statistical techniques which are important for analyzing data arising from clinical and laboratory studies. Major topics include elements of probability, introduction to estimation and inference, distribution free methods, contingency tables, life tables, regression analysis, and elements of study design. Applications are stressed. Designed as an alternate to BIO 201ab, for students desiring more emphasis on theoretical developments or those having had an introductory statistics course at the level of BIO 201ab. Credit is not given for both BIO 200ab and BIO 201ab.
Prereq. Courses in algebra and calculus.

BIO 201ab. Principles of Biostatistics
Lectures. *Two 1-hour sessions each week.*
Laboratory. *One 2-hour session each week. 5 units.* Dr. Pagano.
Lectures and laboratory exercises acquaint the student with the basic concepts of biostatistics and their application and interpretation. Topics include descriptive statistics, probability distributions, inference, tests of significance, association, regression, and life tables.
Note: Credit is given for only one of these courses: BIO 200ab, BIO 201ab, or HPM-BIO 203b,c,d. This course cannot be counted as part of the credit requirement for a major or minor doctoral field.

HPM-BIO 203b, 203c, 203d. Statistical Methods for Health Policy and Management (Module I, II, III)
Lectures. *Three 2-hour sessions each week. 2.5 units each period.* Dr. DeGruttola, Dr. Neuberg.
(Course described under Health Policy and Management.)

BIO 204ab. Biostatistics for Medical Investigators
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Gelman.
This course is aimed at fellows, residents, and clinical investigators. Topics include diagnostic test analysis (sensitivity, specificity, ROC curves, Bayes Theorem), risk of disease (prevalence, incidence, cohort studies, case control studies), treatment effects (summary statistics, single, paired, and two sample tests, analysis of proportions, survival data), models (linear, logistic, proportional hazards), and clinical trials (randomization, stratification, eligibility, blinding, interpretation).

BIO 206s. Statistical Principles in Medical Research
Lectures. *Five 1¾-hour sessions each week for eight weeks. 5 units.* Dr. Orav.
Designed primarily for participants in the Training Program in Clinical Effectiveness. Topics include an introduction to concepts in probability and statistics, discrete data analysis, regression, analysis of variance, experimental design, and issues in clinical trials. Emphasis is on allowing participants to think about issues in designing and analyzing studies. Mathematical and theoretical issues are not pursued in depth.
Prereq. Acceptance into the Program in Clinical Effectiveness, or sufficient quantitative background and medical training for a detailed course emphasizing clinical applications.

DBS-BIO 207b, 207cd. Statistical Methods in Biology
(Formerly ESP-BIO 207cd)
Lectures, problem sessions. *Three 1½-hour sessions each week. 2.5 units for "b" period; 5 units for "cd" semester.* Dr. H. Feldman.
(Course described under Division of Biological Sciences.)

BIO 210cd. The Analysis of Rates and Proportions
Lectures. *Two 1½-hour sessions each week.*
Laboratory (optional). *One 1-hour session each week. 5 units.* Dr. Kalish.
Emphasizes concepts and methods for analysis of data which are categorical, rate-of-occurrence (e.g., incidence rate), and time-to-event (e.g., survival duration). Stresses applications in epidemiology, clinical trials, and other public health research. Topics include measures of association, 2x2 tables, stratification, logistic regression, matched pairs, analysis of rates, and survival data analysis.
Prereq. BIO 200ab or BIO 201ab or equivalent.

BIO 211cd. Regression and Analysis of Variance in Experimental Research
Lectures. *Two 1½-hour sessions each week.*
Laboratory. *One 1-hour session each week. 5 units.* Dr. Larson.
Covers analysis of variance and regression, including details of data-analytic techniques and implications for experimental design. Also included are probability models and computing. Students learn to formulate a scientific question in terms of a statistical model, leading to objective and quantitative answers.
Prereq. BIO 200ab or BIO 201ab or equivalent.

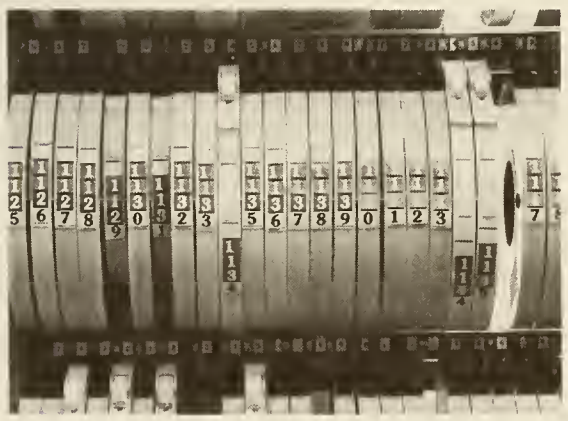
BIO 212cd. Survey Research Methods in Community Health
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Zelen, Dr. Mangione.
Covers research design, sample selection, questionnaire construction, interviewing techniques, the reduction and interpretation of data, and related facets of population survey investigations. Focuses primarily on the application of survey methods to problems of health program planning and evaluation. Treatment of methodology is sufficiently broad to be suitable for students who are concerned with epidemiological, nutritional, or other types of survey research.

BIO 213cd. Vital and Health Statistics
Not given 1989–90; offered alternate years.
Lectures and discussions. *One 2-hour session each week. 2.5 units.* Dr. Zelen, Dr. Davis.
Discusses the types, sources, and methods of data collection, and uses of vital and health statistics for public health purposes. Emphasizes effective use of existing data, together with consideration of incomplete data and sampling methods for obtaining new information, both nationally and internationally.

BIO 214c. Principles of Clinical Trials
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Gelman.
Designed for individuals interested in the scientific, policy, and management aspects of clinical trials. Topics include types of clinical research, study design, treatment allocation, randomization and stratification, quality control, sample size requirements, patient consent, and interpretation of results. Students design a clinical investigation in their own field of interest, write a protocol for it, and write essays critiquing recently published medical literature.
Prereq. An introductory statistics course.

BIO 216cd. Applied Survival Analysis
(Formerly BIO 265ab)
Lectures. *Two 1½-hour sessions each week.* 5 units. Dr. D. Harrington.
This is an applied course for those wishing to learn about modern developments in the practice of survival methods. Topics include parametric distributions (exponential, Weibull), role of the hazard function, estimation of survival distributions using life table and maximum likelihood methods, two-population problems, proportional hazard models and regression, tests of proportional hazard assumption, and software for implementing testing and estimation procedures. Emphasis is on practical experience in survival data analysis.
Prereq. BIO 210cd or BIO 220ab or BIO 221cd.

BIO 217ab. Statistical Computing
(Formerly BIO 273ab)
Lectures. *Two 1½-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 5 units.* Dr. Orav.
An intermediate-level course introducing students to some computer-intensive methods useful in biostatistics. Provides an overview of computing, covering hardware, systems software, and biostatistical applications software. Most course time is spent learning fundamental ideas and algorithms involved with numerical analysis, matrix operations, simulation, and optimization. Implementation of selected, frequently used techniques, such as nonlinear regression, stochastic modeling, or bootstrapping, is discussed.
Prereq. A course in biostatistics or statistics. Knowledge of a programming language or permission of the instructor.



BIO 218d. Database Architecture and Systems
(Formerly BIO 275d)
Lectures, demonstrations. *Two 1½-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 2.5 units.* Dr. Testa.
Introduces the theoretical and operational techniques useful in data management of clinical trials and biomedical and epidemiologic research studies. Primary instructional areas focus upon the design and structure of database architecture, data collection techniques, and computerized database systems. Specific topics include data models, data base structure (both logical and physical), forms and coding, data entry systems, file organization, and an introduction to INGRES.
Prereq. BIO 112 or BIO 113b or equivalent, or permission of the instructor.

BIO 220ab. Methods of Data Analysis
Lectures, discussions. *Two 1½-hour sessions each week.*
Laboratory (optional). *One 1½-hour session each week. 5 units.* Dr. L. Ryan.
A course in basic statistical methods for data analysis. Topics included are the analysis of normally distributed data, including linear regression models and ANOVA, distribution free methods, ideas of generalized linear models, and discrete data methods. Method of moments, least squares, and maximum likelihood are discussed.
Prereq. At least one course in statistics which uses the calculus, or permission of the instructor.

BIO 221cd. Discrete Multivariate Analysis
Lectures. *Two 1½-hour sessions each week.*
Laboratory (optional). *One 1-hour session each week. 5 units.* Dr. Wypij.
Deals with the use of log linear and logistic models for analyzing count data. Emphasizes practical application rather than mathematical theory. Extensive use is made of computer packages for data analysis. Topics include the analysis of contingency tables, chi-square and exact tests, measures of association, logistic regression, log linear analysis using iterative proportional fitting, and the binomial, multinomial, and Poisson distributions.
Prereq. BIO 210cd or BIO 211cd or equivalent, or permission of the instructor.

BIO 230ab. Probability Theory and Applications
Lectures. *Two 1½-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 5 units.* Dr. Kim.
A course in probability theory fundamental to the statistics program. Topics include algebra of events, axiomatic foundations, combinatorial probability, discrete and continuous sample spaces, Stieltjes integration, conditional probability and independence, random variables, generating functions and characteristic functions, standard distributions, expectation and variance operators, limit theorems, Poisson processes, and applications in health-related areas.
Prereq. Intermediate calculus (one or two semesters beyond elementary calculus).

BIO 231cd. Statistical Inference I
Lectures. *Two 1½-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 5 units.* Dr. Gray, Dr. Lefkopoulou.
A fundamental course in statistical inference. Topics include sufficiency, exponential families, parameter estimation, maximum likelihood, Bayesian theory, small and large sample properties of estimators, interval estimation, hypothesis testing, Neyman Pearson theory, score tests, likelihood ratio tests, and similar tests. The theory is illustrated with examples from health-related research.
Prereq. BIO 230ab or equivalent.

BIO 235ab. Regression and Analysis of Variance
Lectures. *Two 1½-hour sessions each week.*
Laboratory. *One 2-hour session each week. 5 units.* Dr. Zelen.
Describes general procedures of estimation and hypothesis testing for linear models: least squares and maximum likelihood estimation, Cochran's theorem, Gauss-Markov theorem, estimable functions, multivariate normal distribution, and simultaneous inference. Discusses techniques of analysis of variance and experimental design: partitioning sum of squares, factorial experiments, nested designs, analysis of covariance, and repeated measures.
Prereq. BIO 231cd or equivalent; familiarity with matrix algebra. BIO 211cd or equivalent recommended.

BIO 236ab. Theory of Biometry I
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Tsiatis.
Discusses the theoretical basis of concepts and methodologies associated with survival data and censoring, nonparametric tests, and competing risk models. Much of the theory is developed using counting processes and martingale methods. Material is drawn from recent literature.
Prereq. BIO 221cd and BIO 231cd or permission of the instructor.

BIO 245cd. Multivariate Analysis for Quantitative Data
To be given 1989–90; offered alternate years.
Lectures, student presentations. *Two 1½-hour sessions each week. 5 units.* Dr. Ware.
An introduction to multivariate analysis and the analysis of serial measurements. Topics include the multivariate normal distribution, estimation of the mean and covariance matrix, Hotellings T^2, principal components, factor analysis, random effects and mixed models, and variance components. Reviews classical and new

methods for the analysis of repeated measures and longitudinal data. Presents estimating equations and generalized normal models as extensions of the normal theory. Discusses computational issues for both traditional and new methodologies.
Prereq. BIO 231cd and BIO 235ab.

BIO 246cd. Theory of Biometry II
Not given 1989–90; offered alternate years. Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Lagakos, Dr. Gray, Dr. Zelen.
This course is divided into three distinct units: stochastic processes and biomedical phenomena, theory of logistic and polychotomous regression, and nonparametric regression. Topics include point processes, recurrent events, and screening for early detection of disease; conditional logistic regression and its generalizations, models for binary time series, tests on Markoff chains, and extensions to urn models; scatterplot smoothing, ACE algorithm, projection pursuit, and generalized additive models.
Prereq. BIO 231cd or BIO 236ab, or permission of the instructor.

BIO 247cd. Design of Scientific Investigations
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Laird.
Discusses those aspects of statistical theory and practice relative to the design of scientific investigations in the health sciences. Topics include planning of sample surveys; basic principles of experimental design: randomization, replication, and balance; randomization related to distribution-free methods; fixed, mixed, and random models: experimental designs and techniques for reducing variability; block designs and analysis of covariance; human studies; multicenter longitudinal follow-up and observational studies; sequential studies; adaptive and allocation rules; special features with discrete response data.
Prereq. BIO 235ab or permission of the instructor.

BIO 251ab. Statistical Inference II
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Gatsonis, Dr. Rotnitzky.
This course is devoted to two main topics: Bayesian inference and the theory and practice of bootstrapping methods. Applications are drawn from current biomedical problems. Includes an intensive introduction to the fundamentals of Bayesian inference with emphasis on Bayesian methodology for biomedical applications. Topics include formulation of the Bayesian paradigm, conjugate and "noninformative" priors, hierarchical models, approximations to the posterior distribution, empirical Bayes methods, Bayesian robustness and sensitivity analysis, and nonparametric Bayesian methods. The bootstrapping and related topics include estimation of variance, bias and mean square error, confidence sets for the functions of parameters, estimating coverage probabilities of a bootstrap confidence set, estimating the distribution of the least squares estimator, simultaneous confidence intervals, Behrens-Fisher problem, and bootstrap likelihood ratio tests.
Prereq. BIO 231cd or permission of the instructor.

Topics in Biostatistics (BIO 261-269)
Offered primarily for students majoring in biostatistics or epidemiology, although qualified students from other departments are welcome. The topics covered vary from year to year, based on recent developments in biostatistics and the research interests of the instructor.

BIO 268cd. Exact Nonparametric Inference
Lectures. *One 1½-hour session each week. 2.5 units.* Dr. Mehta, Dr. Patel.
Introduces modern algorithms for exact nonparametric inference through specific examples, including ordered or unordered contingency tables, linear rank tests, logistic regression, and group-sequential designs. The basic techniques utilized by these algorithms are recursion, network and graph theory, dynamic programming, and Monte Carlo variance reduction. To show how these tools may be implemented on a computer, some fundamental computer science concepts including data structures, hash coding, and numerical instability are also discussed.
Prereq. BIO 230ab and BIO 231cd; knowledge of FORTRAN, C language, or PASCAL.

HPM-BIO 280b. Decision Analysis for Health and Medical Practices
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Weinstein.
(Course described under Health Policy and Management.)

HPM-BIO 281c. Seminar on Clinical Decision Analysis
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Pliskin.
(Course described under Health Policy and Management.)

HPM-BIO 282d. Cost-Effectiveness and Cost-Benefit Analysis for Health Program Evaluation
Seminars, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Weinstein, Dr. Graham.
(Course described under Health Policy and Management.)

HPM-BIO 283b. Behavioral Decision Theory in Health
Not given 1989–90.
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.
(Course described under Health Policy and Management.)

HPM-BIO 284ab. Topics in Health Decision Sciences
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Pliskin.
(Course described under Health Policy and Management.)

ESP-BIO 290cd. Causal Inference from Observational Data
Lectures. *One 3½-hour session each week. 5 units.* Dr. Robins.
(Course described under Environmental Science and Physiology)

BIO 310-315abcd. Tutorial Programs
Time and credit to be arranged.
An opportunity for tutorial work is offered for interested and qualified students or small groups of students. Arrangements must be made with individual faculty members and are limited by the amount of faculty time available. These programs are open to students specializing in biostatistics and also to students in other fields who wish to go beyond the content of the regular courses. Six broad categories of this tutorial instruction are identified by the six course numbers below.

310 *Statistical Methods*
Guided study in specific areas of statistical methodology and applications.

311 *Teaching*
Work with members of the department in laboratory instruction and the development of teaching materials.

312 *Consultation*
Work with members of the department on current statistical consultation activities.

313 *Computing*
Guided study in scientific programming, numerical methods, and data management.

314 *Study Design*
Guidance in developing statistical design of a study in which the student has a particular interest.

315 *Data Analysis*
Guidance in the statistical analysis of a body of data in which the student is interested.

Students may register for BIO 310-315 for a maximum of 5 credit units in the summer term.

BIO 350. Research
Candidates for the Doctor of Public Health or Doctor of Science degree may arrange for individual research. The work may be part of the program for a doctorate in this department or may be integrated with doctoral research in other departments.

■ CANCER BIOLOGY

CB 202b. Critiques of Current Literature in Virology and Immunology
Seminars. *One 2-hour session each week. 1 unit.* Members of the Department.
Papers on topics of general interest are selected from current periodicals and critically reviewed as to soundness of experimental design, validity and significance of results and conclusions, organization of manuscript, and clarity of presentation. The course is not given if less than eight students enroll.

CB 204ab. Immunobiology
Lectures. *One 1½-hour session each week. 5 units.* Dr. Glimcher, Faculty and Guest Lecturers.
Examines the anatomy and physiology of the immune system, fate of antigen, cell trafficking, cellular interactions, and regulation of the immune response, and B and T cell recognition mechanisms. Principles of immunoregulation are discussed in the context of current literature. Grade is based on class participation and a paper.
Prereq. Basic courses in microbiology and immunology and permission of the instructor.

CB 207cd. Radiation Biology
To be given 1989–90; offered alternate years.
Lectures. *Three 1-hour sessions each week. 5 units.* Dr. Little.
This course is divided into two parts: cellular and human radiobiology. The first includes radiation chemistry, cell survival, transformation and mutagenesis, cytogenic effects, UV-photobiology, and cellular and molecular repair processes. The second covers effects of radiation in man and characteristics of internal and external human exposure. The biologic basis of the acute radiation syndrome and the human epidemiologic data for radiation carcinogenesis are emphasized.
Prereq. ESP 205ab or college-level course in biology.

CB 212ab. Introduction to Cancer Biology
To be given 1989–90; offered alternate years.
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Cairns, Dr. Eisenstadt, Guest Lecturers.
Emphasizes current experimental approaches to studying cancer biology and the process of carcinogenesis. Topics include the biology of cell modification and differentiation, the phenotype of the cancer cell, the properties of human and animal cancers, the process of cell transformation, mutagenesis, carcinogen metabolism and the general features of cancer epidemiology, and what these say about the causes of human cancer. Early in the course, several introductory lectures are given to cover basic concepts of genetics, cell biology, and molecular biology.
Prereq. A background in some branch of science is desirable.

CB 217ab. Human and Animal Virology
(Virology 101 and Animal Virology 2684)
To be given 1989–90; offered alternate years.
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Essex, Dr. Mullins.
Provides students with fundamentals of medical virology and introduces new and relevant concepts emanating from recent and ongoing research. Topics include virus-host cell interaction, molecular aspects of virus replication and pathogenesis, pathogenesis, chronic and latent infections, epidemiology, environmental factors, host defense mechanisms, molecular and virological techniques, and community control measures. Selected virus groups are discussed in detail.
Students should discuss enrollment with instructor before registering. This course is not given if less than eight students enroll.

CB 302-308abcd. Tutorial Programs
Time and credit to be arranged.
Enrollment requires the consent of the staff member responsible for supervision of the research. The various subject areas are listed below by category.

302 *Viruses*
Dr. Essex, Dr. Haseltine, Dr. Mullins.
Isolation and identification of representative viruses by use of cell culture, animal inoculation, and serologic and molecular biological techniques.

303 *Immunochemical Methods*
Dr. Essex, Members of the Department.
Methodology of immunofluorescence, enzyme-linked immunoassays, 51 Cr release, chromatography, immunoelectrophoresis, monoclonal antibodies as applied to oncogenesis, and resistance to infectious viral agents.

304 *Public Health Laboratory*
Associates at the State Laboratory Institute.
The State Laboratory Institute is engaged in a variety of programs related to public health. These include the development, preparation, and testing of new and standard serums, vaccines, and blood fractions; research in various aspects of applied immunology; various aspects of diagnostic service in the fields of bacteriology, virology, and congenital metabolic disorders; and field studies on arboviruses. Individual arrangements for study can be made in any of these programs.

305 *Tumor Biology*
Members of the Department.
Approaches and techniques for the study of cancer as an infectious disease. Procedures used to study tumor cell and tumor virus marker antigens and antibodies demonstrated. The significance of these markers for epidemiological, etiological, and diagnostic investigations of various tumor systems of known and unknown causes discussed. The relationship between the immune response and the oncogenic process examined.

306 *Cellular Immunology and Molecular Biology of the Immune System*
Dr. Glimcher.
Examines the events following immunization of infection where the quality and quantity of the immune response is regulated by subsets or lymphocytes and their products. The mechanism of this regulation is explored by analyzing immunologic circuits, idiotypic recognition, and antibody and cell mediated cytotoxicity.

307 *Radiobiology*
Dr. Little.
Current topics in radiobiology at molecular, cellular, and organismal levels. Cytotoxic, mutagenic, and carcinogenic consequences of ionizing and nonionizing radiations are examined, with emphasis on genetic, physiologic, and environmental factors that modify these biologic effects.

308 *Chemical Carcinogenesis*
Dr. Cairns, Dr. Haseltine.
Methodology and interpretation of tests for chemical carcinogens, mutagenesis and repair of DNA, and the time course of the formation of cancer.

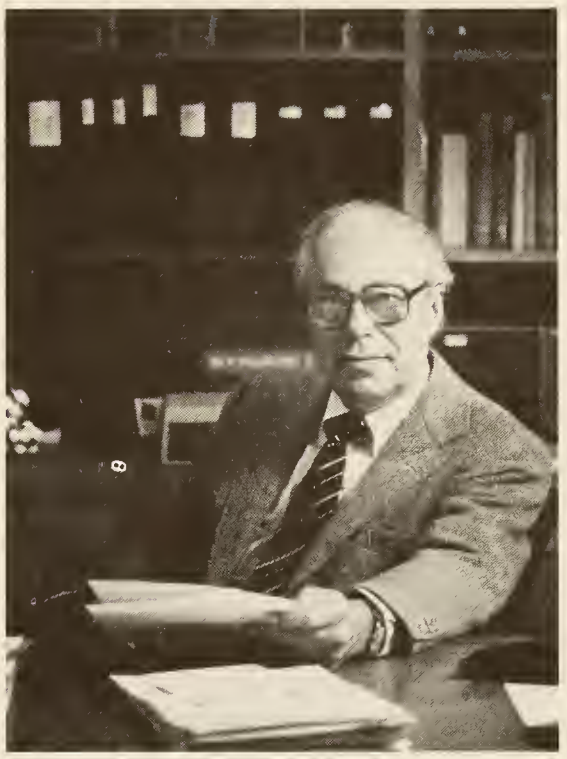
CB 350. Research
Qualified doctoral candidates, research fellows, and full-time special students may register for CB 350 to undertake original research in virology, bacteriology, immunology, or in one of the disciplines available at the State Laboratory Institute. A number of the current research activities of the department are listed under CB 302-308. Inquiries about specific research opportunities should be addressed to the chairman of the department.

■ DIVISION OF BIOLOGICAL SCIENCES

DBS 205ab/205cd. Interdepartmental Seminar in the Biological Sciences
(Formerly ID 205ab/205cd)
Lectures, discussions. *One 3-hour session in alternate weeks. 2.5 units each semester.* Dr. Cairns, Dr. Mullins, Members of the Division of Biological Sciences.
HSPH faculty present seminars on their current research in the biological sciences and direct a student discussion of the logic and experimental design of this research. Topics include chemical and viral carcinogenesis, DNA damage and repair, immunology, molecular biology, radiobiology, respiratory biology, and virology. In the "ab" semester, the course runs in alternate weeks opposite DBS 206ab.
Required for first-year students in Cancer Biology and in the Division of Biological Sciences.

DBS 206ab. Papers in the Biological Sciences: Past and Present
(Formerly ID 207ab)
Discussions. *One 3-hour session in alternate weeks. 2.5 units.* Dr. Samson, Dr. Cairns, Dr. Mullins.
Students and faculty discuss "classic" papers in biology from the perspective of their logic and experimental design rather than their factual content. The course is intended to provoke in-depth discussion and assessment of biochemical, physical, and genetic methods employed in testing hypotheses. The course runs in alternate weeks opposite DBS 205ab.
Required for first-year students in the Division of Biological Sciences.
Prereq. Permission of the instructor.

DBS-BIO 207b, 207cd. Statistical Methods in Biology
(Formerly ESP-BIO 207cd)
Lectures, problem sessions. *Three 1½-hour sessions each week. 2.5 units for "b" period; 5 units for "cd" semester.* Dr. H. Feldman.
Teaches descriptive and inferential data analysis by means of examples in biochemistry, genetics, cell biology, physiology, and population biology. Topics include probability, discrete data, normal comparisons, analysis of variance, experimental design, simple regression, and model building.
This sequence satisfies the intermediate-level statistics requirement for doctoral students.
Prereq. DBS-BIO 207b is the prerequisite for DBS-BIO 207cd.



Dr. Elkan Blout directs the Division of Biological Sciences, a multidisciplinary doctoral program which addresses major public health problems through biological research.

DBS-ESP 221cd. Methodology in Cell Biology
(Formerly ESP 221cd)
To be given 1989–90; offered alternate years.
Lectures. *Two 2-hour sessions each week.* Laboratory, review sessions. *To be arranged. 5 units.* Dr. Valberg, Members of the Division of Biological Sciences, Guest Lecturers.
Provides an overview of experimental approaches in cell biology used to study cytoplasmic structure, secretory products, the plasma membrane, the nucleus, cell organelles, and macromolecules. The goal is to appreciate how our view of cell structure and function is shaped by the methods we have available to examine cells. Techniques such as electron microscopy (morphometry and stereology), protein fractionation, markers (fluorescent, immune, radioactive), molecular biology of DNA, cell cycle analysis, quantitative light microscopy, and nuclear magnetic resonance are presented along with integrative material on the relationship of cell biology to inhalation toxicology, pathogenesis of disease, and evaluation of cell function and injury. Whenever possible, lecture demonstrations or laboratory demonstrations are used to help present the methods used in cell research.

DBS 300ab/300cd. Laboratory Rotations
Laboratory. *12-20 hours each week. 5 units each semester.* Dr. Blout, Members of the Division of Biological Sciences.
Offers hands-on experimental methods of research in the biological sciences. Consists of individual original laboratory work. Includes participation in seminars, journal clubs, and assigned readings.
Required for first-year students in the Division of Biological Sciences.
Prereq. Permission of the instructor.

■ ENVIRONMENTAL SCIENCE AND PHYSIOLOGY

ESP 201a, ESP 201c. Principles of Environmental Health I
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Moeller.
Represents a first step in a review of the more important environmental health problems facing society. Topics include environmental physiology, radiation protection, community air pollution, occupational health, and municipal water purification and wastewater treatment. Students are required to develop and submit plans for a term paper.
Note: Students in the MPH program are required to take this course, plus either ESP 202b or ESP 203d. The subject matter coverage is arranged so that courses can be taken in any sequence. For convenience in scheduling, ESP 201 is offered in both the "a" and "c" periods.

ESP 202b. Principles of Environmental Health II
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Moeller.
Represents a continuation in the review of the more important environmental health problems facing society. Topics include energy and the environment, environmental toxicology and hazardous waste management, environmental law and economics, accidents and public health, insect and rodent control, and environmental monitoring. Submission of a term paper is required.

ESP 203d. Principles of Environmental Health III
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Moeller.
Emphasizes environmental health problems in the less-developed countries. Topics include individual household water supplies and wastewater treatment; basic sanitation; insect and rodent control; foodborne diseases; housing and home accidents; operation, maintenance, and management of environmental systems; and the selection of appropriate technology for coping with such problems. Submission of a term paper is required.
Note: Students in the MPH program are required to take either this course or ESP 202b, plus ESP 201a or ESP 201c. Because of the special orientation of the subject matter presented, it is suggested that students interested in environmental health problems in the less-developed countries enroll in ESP 203d. Students interested in the subject matter in this course, as well as that presented in ESP 202b, may take both courses, as well as ESP 201a or ESP 201c, and receive credit for all three courses (7.5 units).

TOX-ESP 204ab. Principles of Toxicology
(HMS BCMP 713, FAS BCMP 218)
Lectures, seminars. *Two 2-hour sessions each week.*
Discussions (optional). *One 2-hour session each week. 5 units.* Dr. Schlegel, Dr. Kelsey, Members of the Department.
(Course described under Toxicology.)

ESP 205ab. Human Physiology
Lectures, conferences, demonstrations. *Two 1-hour sessions and one 2-hour session each week. 5 units.* Dr. Reid, Members of the Respiratory Biology Program.
Students, including those lacking a background in biology, are offered an intensive introduction to biological principles and to the physiology of cells, organ systems, and organisms. Some pathophysiology and several laboratory exercises are included. Students without college courses in physics, chemistry, and mathematics should speak with the instructor beforehand.

EPI-ESP 215cd. Case Studies in Environmental and Occupational Epidemiology
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Monson, Dr. Robins, Dr. Dockery.
(Course described under Epidemiology.)

DBS-ESP 221cd. Methodology in Cell Biology
(Formerly ESP 221cd)
To be given 1989–90; offered alternate years.
Lectures. *Two 2-hour sessions each week.* Laboratory, review sessions. *To be arranged. 5 units.* Dr. Valberg, Members of the Division of Biological Sciences, Guest Lecturers.
(Course described under Division of Biological Sciences.)

ESP 223ab. Advanced Respiratory Physiology
Lectures, demonstrations, student presentations. *Two 1½-hour sessions each week. 5 units.* Dr. Shore, Members of the Department.
Covers a broad range of topics in respiratory physiology, including airway physiology and pharmacology; host-defense mechanisms; lung endocrine functions; pulmonary circulation; lung, chest wall, and airway mechanics; and ventilation/perfusion balance. Reviews classic concepts and presents recent advances.
Prereq. College-level physiology or ESP 205ab or equivalent, or permission of the instructor.

ESP 231cd. Occupational Health Policy and Administration
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Monson, Dr. Nobel, Dr. Boden, Dr. Hashimoto.
Examines the legal, economic, and political foundations of occupational health activities in the United States. Discusses the roles of government, unions, corporations, and research organizations. Helps students acquire an understanding of management functions in corporations. Enables students to develop the knowledge and skills in the above areas necessary to apply medical, industrial hygiene, and statistical skills to achieve a healthful workplace.
Prereq. Non-ESP students must have the permission of the instructor.

ESP 232cd. Introduction to Occupational Medicine
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Christiani, Dr. Kelsey.
Reviews the diagnosis and management of occupational diseases following exposure to specific workplace substances, including asbestos, lead, organic solvents, and other substances. Considers methods of diagnosis of early organ system effects of chemicals and techniques for assessing disability.
Prereq. Limited to physicians or others with adequate training by permission of the instructor.

ESP 234cd. Basic Problems in Occupational Health
Lectures. *Two 2-hour sessions each week, "c" period; one 2-hour session and one 3-hour session each week, "d" period. 5 units.* Prof. Burgess, Dr. Goldman, Dr. Ciriello.
Focuses on the assessment of workplace hazards, the physiology and biomechanical aspects of work, and a practical problem-solving approach to health problems in various work settings. Case studies and walk-through field trips to local industries complement didactic material. Emphasizes the relationship between working conditions and health, with special reference to the recognition, measurement, and control of industrial hazards.
Prereq. ESP 251a or ESP 205ab or equivalent.

ESP-EPI 235ab. Scientific Basis of Occupational Health Regulations
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Eisen, Dr. Robins, Dr. Monson, Dr. Wegman.
Provides students with the opportunity to review the scientific basis for the association of selected occupational exposures and disease. Special emphasis is placed on evaluation of the epidemiologic literature, and on occupational cancer, respiratory disease, and other kinds of occupational morbidity. Attention is directed to the interface of science and regulatory policy and the role of risk analysis in setting health standards. Enrollment is limited to 15.
Prereq. EPI 200a or EPI 201a, BIO 200ab or BIO 201ab, ESP 234cd or permission of the instructors. EPI-ESP 215cd is strongly recommended.

ESP 237ab. Introduction to Occupational Health Nursing
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Monson, Ms. Travers.
Covers the fundamental concepts of occupational health and safety relevant to the planning and implementing of targeted programs for workers, and provides a forum for discussion of related social, political, economic, legal, medical, and nursing issues. Topics include environmental determinants of health, factors which promote or inhibit the health of workers, delivery of health services in the work setting, and skills and strategies essential to the development of leadership roles in occupational health nursing.

ESP 238ab. Occupational Health Nursing Management
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Monson, Ms. Travers.
Students apply skills and knowledge in occupational health nursing and occupational health and safety to the development of appropriate occupational health programs. Includes organizational development, communication skills, and techniques for managing change. This is considered an advanced course in occupational health nursing.
Required for all students in Occupational Health Nursing.

ESP 239cd. Case Studies in Occupational Health Nursing
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Monson, Ms. Travers.
Provides a foundation for the development of skills and strategies necessary for program planning and development in occupational health through the critique of case studies of workplace situations and circumstances. Students identify health hazards, review injury/illness data, evaluate existing occupational health programs, and make recommendations. Prepares students for field placement in occupational health nursing.

ESP 241cd. Occupational Safety
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Snook, Dr. Mangone.
Covers the principles of occupational safety. Topics include growth of the field of occupational safety; safety regulation and standards; theoretical models of accident causation; accident investigation procedures; and engineering, behavioral, and administrative techniques for accident control. Builds toward the development and validation of prescriptive systems for the alleviation of workplace hazards.

ESP 243ab. Ergonomics/Human Factors
Lectures, demonstrations. *One 2-hour session each week. 2.5 units.* Dr. Snook.
Emphasizes the design of the job to fit the worker. Specific problems are investigated which result from the nature of the job itself, e.g., low back injuries, fatigue, hand

disorders, slips and falls, human error, and psychological stress. The physiological, psychological, and anatomical characteristics of the worker are considered in the development of good job design principles.

ESP 251a. Health Hazards of Manufacturing Processes
Lectures, field trips. *One 2-hour session and one 3-hour session each week. 2.5 units.* Prof. Burgess.
Deals with the recognition of health hazards in the workplace and the atmospheric environment, using a unit operations approach to manufacturing processes. Designed as an introduction to other courses which consider the evaluation and control of hazardous conditions in the workplace and atmospheric environment.

ESP 253cd. Environmental Control
(ENG SCI 270)
Lectures. *One 2-hour session each week.* Laboratory. *One 3-hour session each week. 5 units.* Dr. Rudnick, Dr. Cudworth, Mr. Di Berardinis, Mr. Tocci, Prof. Burgess.
Covers the design and evaluation of local and general exhaust ventilation systems for the control of toxic air contaminants; control of heat stress in industry; respiratory protection equipment; the fundamentals of sound and vibration generation, transmission, and reception; and noise control fundamentals. These topics are explored by means of lecture, laboratories, and field trips to industrial plants.
Required for concentrators in industrial hygiene and air pollution control.

ESP 261ab. Properties of Environmental Contaminants (ENG SCI 276)
Lectures. *Two 1-hour sessions each week.* Laboratories. *One 4-hour session each week. 5 units.* Dr. Koutrakis, Dr. Rudnick.
Covers the properties of airborne contaminants (aerosols, gases, vapors) and the physical principles underlying their behavior. Topics include particle motion due to gravitational, thermal, and electrostatic forces; diffusion; particle impaction; filtration; and physical properties of gases and vapors. Laboratories cover optical and electron microscopy, sampling, measuring concentrations, and particle size measurement.
Required for concentrators in industrial hygiene and air pollution control.
Prereq. Calculus and college physics.

ESP 262cd. Assessment, Evaluation, and Management of Environmental Exposure
(ENG SCI 273)
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Evans, Dr. P. B. Ryan.
Covers principles of exposure assessment and risk analysis; introduces basic methods for monitoring and modeling ambient concentrations; examines relationships between concentration, exposure, and dose; discusses risk assessment; explores the uses of indoor programming, statistical decision analysis, and Monte Carlo simulation in environmental management. Required for concentrators in air pollution, environmental management, industrial hygiene, and/or radiation protection.
Prereq. Calculus and chemistry, or permission of the instructor.

ESP 263cd. Analytical Chemistry and Exposure Assessment
Lectures. *One 2-hour session each week.* Laboratory. *One 4-hour session each week. 5 units.* Dr. P. B. Ryan, Dr. Yanagisawa.
Exposes students to various techniques in analytical chemistry appropriate for environmental assessment in occupational and community settings. Groups of students are required to use these techniques in the design, implementation, and presentation of projects in environmental assessment. The course requires field work.
Prereq. Permission of the instructor.

ESP 264d. Environmental Health Evaluation and Management
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. J. Harrington.
Introduces quantitative approaches for modeling, evaluation, and management, with an emphasis on applications in environmental health. Examples drawn from environmental engineering, natural resource development, and risk management literature are examined using a systems analysis framework. Uses personal computers.
Prereq. ESP 262cd or permission of the instructor.

ESP 265cd. Air Pollution and Hazardous Waste
Lectures, seminars. *Two 2-hour sessions each week. 5 units.* Dr. Spengler, Dr. First, Dr. Ferris.
Critically examines the federal and state laws governing hazardous waste and air pollution. Reviews health effects, damage to animals, plants, and groundwater that may occur directly or by intermedia transport. Presents control, legal, and enforcement aspects.
Prereq. (suggested) ESP 261ab, ESP 262cd, ESP 263cd.

ESP 266ab. Environmental Microbiology
(FAS EPS 30)
Lectures. *Two 1½-hour sessions each week.*
Laboratory. *One 3-hour session each week. 5 units.* Dr. Mitchell (Faculty of Arts and Sciences), Dr. Ford.
Considers microbial processes in natural habitats, including biogeochemical cycles and metal transformations. Examines evolution of microorganisms and development of survival strategies, as well as microbial processes in specific habitats, such as fresh waters, marine environments, and soils. This is an undergraduate course taught in Cambridge. Additional work is required of HSPH students.
Prereq. A course in biology.

ESP 270b. Basic Radiation Protection
(One half of ENG SCI 278)
To be given 1989–90; offered alternate years.
Lectures, demonstrations. *Two 2-hour sessions each week. 2.5 units.* Dr. Shapiro, Dr. Moeller.
Covers principles of radiation protection, interaction of ionizing particles with matter, the concept of radiation dose from external and internal sources, dose calculations, and radiation measurements.

ESP 271d. Occupational and Environmental Radiation Protection (One half of ENG SCI 278)
To be given 1989–90; offered alternate years.
Lectures, demonstrations. *Two 2-hour sessions each week. 2.5 units.* Dr. Shapiro, Dr. Moeller.
Covers biological effects of radiation; radiation epidemiology; radiation protection standards and regulations; laboratory, industrial, and environmental sources of radiation; and methods of environmental and occupational radiation protection.
Prereq. ESP 270b or equivalent.

ESP-BIO 290cd. Causal Inference from Observational Data
Lectures. *One 3½-hour session each week. 5 units.* Dr. Robins.
Focuses on the instructor's new approach to causal inference in observational studies with sustained exposure periods. Particular attention is paid to the problems that arise when risk factors determine subsequent exposure. Philosophical, statistical, computational, and subject matter issues are considered. Emphasis is on the use of this approach in the control of the healthy worker effect in occupational mortality studies. The use of this new approach in nonexperimental evaluations of the benefits of screening for cancer and of smoking cessation is also considered.
Prereq. Knowledge of epidemiology to the level of EPI 207c and familiarity with statistical models (e.g., logistic regression models).

ESP 300abcd. Tutorial Programs
Time and credit to be arranged.
Opportunities are provided for individual tutorial work for qualified students in the fields of respiratory biology, respiratory epidemiology, occupational medicine, industrial hygiene and ventilation, aerosol technology, radiological health, nuclear medicine, solid waste management, air pollution control, and environmental health management.

ESP 330. Field Work
Supervised site visits and field research projects are available in medical, industrial hygiene, and environmental health departments of industries and governmental agencies. Students in the various programs in occupational health may receive one credit unit for one week of field work in the "e" period. Students participating in the industrial internship program receive 20 credit units for field work associated with their internship.

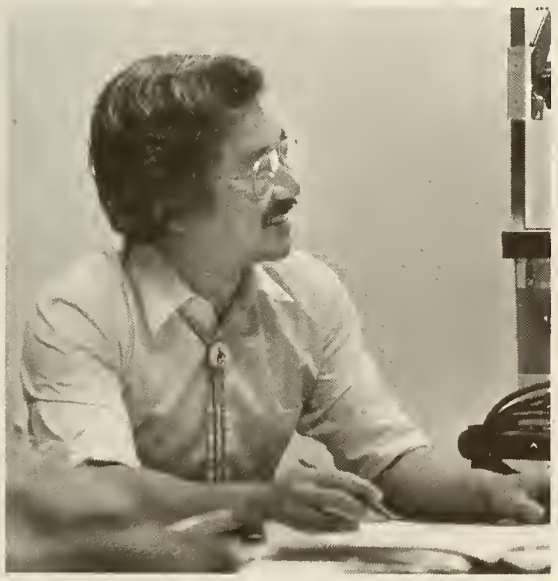
ESP 350. Research
Doctoral students may undertake theoretical, laboratory, or field research under the direction of faculty members working in the following areas:

Air Pollution
Dr. First, Dr. Spengler, Dr. P. B. Ryan, Dr. Yanagisawa, Dr. Ferris, Dr. Speizer, Dr. Dockery, Dr. Rudnick, Dr. Koutrakis.
Industrial gas cleaning, personal exposure monitoring, assessing air pollution potential from simple and complex pollution sources, indoor air pollution, health effects of air contaminants, epidemiology.

Environmental Health Management
Dr. Moeller, Dr. Hornig, Dr. J. Harrington, Dr. Evans.
Quantitative methods of environmental management, risk analysis, environmental standards, and criteria.

Industrial Hygiene
Prof. Burgess, Dr. P. B. Ryan, Dr. Evans.
Monitoring exposures of occupational groups to toxic air contaminants, aerosol, physics, and ventilation; ergonomics applications to job design.

Inhalation Toxicology and Cell Biology
Dr. Brain, Dr. Godleski, Dr. Kobzik, Dr. Valberg, Dr. Warner.
Biological responses to inhaled particles and gases, deposition and clearance mechanisms, macrophage biology, pathogenesis of lung injury.



Dr. Yukio Yanagisawa, Assistant Professor of Environmental Health, leads a class discussion on analytical chemistry and exposure assessment.

Mathematical Physiology
Dr. H. Feldman, Dr. Butler.
Modeling of organ systems, experimental design.

Occupational Health
Dr. Monson, Dr. Christiani, Dr. Eisen, Dr. Kelsey, Dr. Robins.
Epidemiologic and field studies, health hazard evaluation.

Radiological Health
Dr. Reid, Dr. Shapiro.
Reduction of dose from sources of natural origin, radiation safety criteria and standards, control of radioactive contamination.

Respiratory Physiology
Dr. Banzett, Dr. Butler, Dr. Drazen, Dr. Loring, Dr. Reid, Dr. Shore.
Physiological theory, measurement of respiratory function, and structural correlates.

Solid Wastes
Dr. First.
Incineration of solid wastes, including municipal, radioactive, biological, and laboratory materials.

The following courses, offered in the Harvard Faculties of Arts and Sciences and Government, and at the Massachusetts Institute of Technology, are open to qualified students from the School of Public Health and may be of interest to students of environmental health sciences.

Earth and Planetary Sciences 30. Introduction to the Microbiology of Soil and Water
Half course (*fall term*). R. Mitchell.

Engineering Sciences 162. Hydrologic Cycles
Half course (*fall term*). *Tu., Th., 10–11:30.* Fiering.
Prereq. Applied Mathematics 21b and one year of college-level physics.

Engineering Sciences 260. Engineering Systems for Environmental Control
Not given 1989–90; offered alternate years.
Half course (*spring term*). *M., W., F., at 10.* J. Harrington.
Prereq. Engineering Sciences 123 or permission of the instructor.

Engineering Sciences 264. Chemical Aspects of Natural and Polluted Waters
Half course (*spring term*). *M., 1–4.* Butler.
Prereq. Physical chemistry (e.g., Chemistry 10 or Engineering Sciences 161), and some experience with biology and geology.

M-111. Analysis for Decision Making
Half course (*spring term*). *Tu., Th., 10–11:30.* O'Hare.

M-113. Analytic Frameworks for Policy
Half course (*fall term*). *M., W., 9:30–11:00.* Zeckhauser.
Prereq. Microeconomic theory, optimization, and decision analysis.

S-100. Natural Resource and Environmental Economics and Policy
Half course. *Tu., Th., 2:30–4.* Stavins.
Prereq. Introductory microeconomics.

MIT 1.83. Environmental Organic Chemistry
Nine units (*fall term*). *M., W., 1–2:30.* Gschwend.
Prereq. Organic chemistry (e.g., MIT 5.12).

MIT 10.805J. Technology, Law, and the Working Environment
Nine units (*fall term*). *M., 7–10 p.m.* Ashford, Caldart.
Prereq. Permission of the instructor.

■ EPIDEMIOLOGY

Note: Either EPI 200a or EPI 201a satisfies the school requirement of an introductory course in epidemiology. However, individual programs may require one or the other.

EPI 200a. Introduction to Epidemiology
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Cook.
Covers the principles and methods used in epidemiologic research in a rigorous and in-depth manner. Designed as an alternative to EPI 201a for students majoring in Epidemiology or Biostatistics, or who desire more emphasis on issues dealing with the design, analysis, and interpretation of research studies.

EPI 201a. Principles of Epidemiology
Lectures, seminars. *Two 1-hour sessions and one 2-hour session each week. 2.5 units.* Dr. Mueller.
Introduces the basic principles and methods of epidemiology. Lectures are complemented by seminars devoted to exercises or to the discussion of current examples of epidemiologic studies. Credit cannot be received for both this course and EPI 200a.

EPI 202b. Elements of Epidemiologic Research
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Hsieh.
Introduces elements of study design, data analysis, and inference in epidemiologic research. Principles and methods of epidemiology are presented with examples and exercises. Emphasizes practical rather than theoretical issues. May serve as an introduction to more advanced study or as a concluding course for those desiring a working knowledge of epidemiologic methods.
Prereq. EPI 200a or EPI 201a, BIO 200ab or BIO 201ab (may be taken concurrently).

EPI 203c. Design and Interpretation of Cohort and Case-Control Studies
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. A. Walker.
Examines common problems in the design, analysis, and interpretation of cohort studies. Problems of exposure and disease definition, time dependent effects, confounding, and misclassification are considered in the light of data sources typically available. Relevant statistical methods are introduced but developed in detail only insofar as they affect study design.
Prereq. EPI 200a and BIO 200ab, or permission of the instructor.

EPI 204d. Fundamentals for Analysis of Case-Control and Cohort Studies
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. A. Walker.
Extends the discussions initiated in EPI 203c to studies in which information on the population at risk is derived from sample-based data. Implications of case and control selection procedures are discussed in detail, as are the application in case control studies of the concepts and analytic procedures developed for cohort studies.
Prereq. EPI 203c.

EPI 205cd. Practice of Epidemiology
Tutorials, seminars. *Tutorial sessions during "c" period; one 2-hour seminar each week during "d" period. 2.5 units.* Dr. Willett, Dr. Stampfer.
The seminars consist of student presentations of plans for collection and analysis of epidemiologic data, with discussion by students and faculty. Preparatory work is done under tutorial arrangements with members of the faculty. The emphasis is on conceptual issues and not on execution.
Enrollment is limited to 16 students.
Prereq. EPI 200a or permission of the instructor.

EPI 206c. Clinical Epidemiology
Not given 1989–90; offered alternate years.
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Hsieh, Dr. Lee.
Provides a survey of the principles and methodologies of the emerging field of clinical epidemiology for prospective investigators. Sessions combine lectures and reviews by students of recent articles to critique potential approaches to broad classes of problems confronted by clinical investigators, including assessing test performance, estimating prognosis, evaluating therapies, and developing decision rules.
Prereq. EPI 200a or EPI 201a, BIO 200ab or BIO 201ab.

EPI 207c. Readings in Theoretical Epidemiology
To be given 1989–90; offered alternate years.
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Hsieh, Dr. Cook, Dr. Robins.
Reviews a range of both classic and current readings pertaining to methodologic topics in epidemiology. Topics include options in study design (subject selection, matching), confounding (definition and control), modeling (model selection, co-linearity, validity, and efficiency considerations), and selected analytic methods (exposure-response relation assessment, attributable fraction estimates). Background materials on each topic are summarized, followed by a student-led discussion.
Prereq. Permission of the instructor.

EPI 208s. Epidemiologic Research in Clinical Effectiveness
Lectures, discussions. *Five 1¾-hour sessions each week for seven weeks. 5 units.* Dr. Cook, Dr. L. Goldman (Harvard Medical School).
Covers the basic concepts and methods needed for traditional and clinical epidemiologic research through a series of lectures, exercises, critiques of published manuscripts, and presentations by guest speakers. Emphasizes applications to clinical research. Participants are required to make a formal presentation of a study design that addresses a specific clinical problem for discussion by the faculty and fellow students.
Prereq. Acceptance into the Program in Clinical Effectiveness and permission of the instructor.

EPI 209d. Key Developments in Epidemiologic Methods
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Maclure.
Classic papers on quantitative methods and causal inference are reviewed. Topics include selection bias, estimation and testing of relative risk, confounding, matching, interpretation of logistic models, causal criteria in non-experimental studies, and Popperian refutation. The historical perspective serves as a bridge between courses on current standard methods (EPI 203c, EPI 204d) and recent developments in methodology (EPI 207c).
Prereq. EPI 203c and EPI 204d (may be taken concurrently).

EPI 212d. Epidemiology of Cardiovascular and Respiratory Disease
Lectures. *One 2-hour session each week. 1.25 units.* Dr. Stampfer.
Reviews the epidemiology of the chronic cardiovascular and respiratory diseases. Demographic distribution and time trends of these diseases are presented, and known risk factors are discussed.

EPI 213c. Epidemiology of Cancer
Lectures. *One 2-hour session each week. 1.25 units.* Dr. Mueller.
Reviews basic concepts and issues central to cancer epidemiology. Considers the descriptive epidemiology of cancer and discusses the implications of the biology of cancer for identification of risk factors. Examines the role of smoking, radiation, nutrition, and viruses. Each student prepares a review of the epidemiology of a specific cancer site.
Prereq. EPI 200a or EPI 201a.

EPI 214d. Epidemiologic Analysis of Outbreaks of Infectious Disease
Lectures. *One 2-hour session each week. 1.25 units.* Dr. Freeman, Dr. Platt, Dr. Kass (Harvard Medical School).
Discusses the use of epidemiologic methods in analyzing episodes of infectious disease. Various types of outbreaks and various methods of analysis are illustrated. Stresses literature review and practical methodology.

EPI-ESP 215cd. Case Studies in Environmental and Occupational Epidemiology
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Monson, Dr. Robins, Dr. Dockery.
This course has three objectives: (1) to review methods used in evaluating the health effects of physical and chemical agents in the environment, (2) to review available evidence on the health effects of such exposures, and (3) to consider policy questions raised by the scientific evidence. Includes lectures on methodology, seminars on the review and criticism of current literature, and presentations by outside experts on the evaluation and impact of epidemiologic data.
Prereq. EPI 200a or EPI 201a, BIO 200ab or BIO 201ab.

NUT-EPI 216ab. Nutritional Epidemiology
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Willett, Mrs. Witschi.
(Course described under Nutrition.)

EPI 217c. Disease Definition and Methods in Psychiatric Epidemiology
Lectures. *One 3-hour session each week. 2.5 units.* Dr. Tsuang.
Presents the application of basic epidemiologic concepts and methods in psychiatric research. Topics include reliability; validity; analytic methods such as screening, use of case control vs. cohort designs, and use of experimentation vs. quasi-experimentation; and estimates of morbidity and mortality, as they specifically relate to psychiatric research.
Prereq. EPI 200a or EPI 201a, BIO 200ab or BIO 201ab.

EPI 218b. Risk Factors in Psychiatric Epidemiology: Genetics and Environment
Lectures. *One 3-hour session each week. 2.5 units.* Dr. Tsuang.
Covers a range of readings from the early classics to recent work on the occurrence and distribution of psychiatric illnesses. Topics include case identification and classification, treated vs. true rates, early classics in psychiatric epidemiology, effects of treatment, and effects of risk factors on true and treated rates.
Prereq. EPI 200a or EPI 201a, BIO 200ab or BIO 201ab; EPI 217c recommended.

EPI 219d. Psychiatric Screening and Diagnostic Tests
Lectures, seminars, outside practicum involving interviews. *One 2-hour session each week. 2–4 hours practicum each week. 2.5 units.* Dr. Murphy.
Focuses on interview sehedules designed to identify psychiatric disorders and to provide diagnoses. Topics include the history of such instruments as well as their construction, reliability, validity, and appropriateness for different kinds of studies. Practical experience in administering and analyzing the responses to such interviews plays a central role in the course.
Prereq. EPI 217c, EPI 218b.

EPI 220cd. Readings in the History of Epidemiology (FAS History of Science 292r)
To be given 1989–90; offered alternate years.
Seminars. *One 2-hour session in Cambridge and one 1-hour session at HSPH each week. 5 units.* Dr. Brandt (Faculty of Arts and Sciences).
Focuses on the history of the classic texts in modern epidemiology as they have reflected changing views of the etiology of disease. Emphasizes the analysis of primary documents and their impact on medicine and public health. Each student completes a research project and writes it up in the format appropriate to a professional journal.
Prereq. Preparation in the quantitative social sciences.

EPI 221b. Pharmacoepidemiology
To be given 1989–90; offered alternate years.
Lectures. *One 2-hour session each week. 1.25 units.* Dr. A. Walker, Dr. Platt (Harvard Medical School).
Issues related to the discovery and quantification of drug-related illness will be covered in case studies of historically important examples and through presentation of methods currently in use for the formal collection of new data.

EPI 222d. Diabetes Mellitus and Its Complications: Epidemiologic and Genetic Approaches
Lectures. *One 2-hour session each week. 1.25 units.* Dr. Krolewski.
Uses the pathophysiology and descriptive epidemiology of diabetes to illustrate the generation of etiologic hypotheses. Genetic models are introduced together with examples of gene/environment interactions. Continuing with the descriptive epidemiology of the late complications of diabetes, probabilistic models of the natural history of a disease are demonstrated. This is integrated around the goal of optimizing a medical care model for preventing late complications.
Prereq. EPI 200a or EPI 201a and permission of the instructor.

MCH-EPI 223b. Childhood Mental Disorders: Public Health Perspectives
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Deykin.
(Course described under Maternal and Child Health.)

ESP-EPI 235ab. Scientific Basis of Occupational Health Regulations
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Eisen, Dr. Robins, Dr. Monson.
(Course described under Environmental Science and Physiology.)

HPM-EPI 237d. The AIDS Epidemic: Legal and Ethical Analysis
Lectures, case studies. *One 2-hour session each week. 1.25 units.* Dr. Curran, Dr. Mueller.
(Course described under Health Policy and Management.)

EPI 300abcde. Tutorial Programs
Time and credit to be arranged.
Students may participate in departmental research in close association with a staff member. Time and credit are to be arranged with the chairman of the department.

EPI 350. Research
In selecting topics for research in doctoral programs, students should consider the fields in which members of the department are currently working. These include:

Neoplastic Disease
Dr. MacMahon, Dr. Hsieh, Dr. Maclure, Dr. Monson, Dr. Mueller.

Cardiovascular Disease
Dr. Stampfer.

Environmental Epidemiology
Dr. Monson.

Occupational Epidemiology
Dr. Monson.

Epidemiologic Methods
Dr. A. Walker, Dr. Hsieh, Dr. Cook.

Nutritional Epidemiology
Dr. Willett.

Virus-Associated Chronic Disease/AIDS
Dr. Mueller.

Biochemical Epidemiology
Dr. Maclure.

Psychiatric Epidemiology
Dr. Tsuang, Dr. Murphy.

■ HEALTH POLICY AND MANAGEMENT

HPM-BIO 203b, 203c, 203d. Statistical Methods for Health Policy and Management (Module I, II, III)
Lectures. *Three 2-hour sessions each week. 2.5 units each period.* Dr. DeGruttola, Dr. Neuberg.
Introduces students to probability and statistics, emphasizing their application in a variety of health policy and management contexts. Goals include establishing an awareness of basic statistical reasoning and recognition of common difficulties in application. The MINITAB package is used throughout.
Module I(b): Topics include distributions, data display, conditional probability, confidence intervals, hypothesis testing, testing means and proportions, and p-value.
Module II(c): Topics include representative sampling, power, study design, sample size determinations, clinical trials, contingency tables, life tables, goodness-of-fit tests, rate adjustment, non-parametric methods, and analysis of categorical data.
Module III(d): Topics include correlation, simple linear regression, analysis of variance, multiple regression, discriminant analysis, and forecasting.
Sections are graded separately.
May not be taken for credit by students who previously have taken BIO 200ab or BIO 201ab. If substituted for BIO 200ab or BIO 201ab, all three modules must be taken.
Prereq. One college-level course in mathematics. Enrollment of students not in the Department of Health Policy and Management is subject to the approval of the instructors.

HPM 205ab. Economic Analysis for Public Health
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Hemenway.
Provides an introduction to the basic principles of economics and economic analysis, particularly as they apply in the public health field. A systematic introduction to microeconomic theory includes the determinants of supply and demand, the theory of markets, and the concept of economic efficiency. Specific topics in health care economics include demand for health care, insurance, and the market for physician services.
May not be taken for credit by students who previously have taken HPM 206ab.

HPM 206ab. Economic Analysis
Lectures, seminars. *Two 2-hour sessions each week. 5 units.* Dr. Hemenway.
Designed to bring students to an intermediate-level understanding of economic theory. Emphasizes the uses and limitations of the microeconomic approach.
May be taken for credit by students who previously have taken HPM 205ab only with permission of the instructor.

HPM 207d. Economics of Health Policy
Lectures, discussions. *Two 1½-hour sessions each week. 2.5 units.* Members of the Department.
Teaches students to use economic concepts and methods to analyze health policy issues. Applies analytical techniques to dissect complex policy problems and show what insights can be gained. Skills in using several analytical tools are developed, including economic modeling, systematic analysis, econometrics, and simulation. Health policy topics examined using these tools include national health insurance, reimbursement of hospitals and doctors, procompetition, and facility and manpower planning. This course is especially appropriate for students interested in policy analysis in the public or private sector.
Prereq. One semester each of statistics and microeconomics.

HPM 208cd. Health Care Regulation and Planning
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Thorpe.
Examines the regulation and reimbursement of health care institutions and providers. Specific topics include rate regulation of hospitals and long-term care facilities and physician fees, regulatory efforts to improve the quality of care, and access to care by the indigent. Attention is also given to efforts to limit capital spending and the general role of health planning. Focus is on the process of regulatory change, the goals and design of regulatory and planning programs, and their intended and unintended impacts.
Prereq. HPM 206ab or equivalent; HPM-BIO 203d or permission of the instructor.

HPM 209b. Public Health Law and Human Rights
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Curran, Mr. Gostin.
Provides an introduction to the US legal system as it affects health care. Emphasizes concepts of law governing public health programs and distinguishing between legal and moral rights and between legal and policy issues. Among topics considered are methods of regulating health, safety, and competition; rights to medical care; rights of medical patients, the mentally ill, children, and research subjects; due process; equal protection; resource allocation; and problems of balancing personal rights and community protection.
Auditing and convenience attendance are not permitted.

HPM 210c. Medical Malpractice and Risk Management
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Curran, Mr. Moulton.
Focuses upon the development, implementation, and evaluation of risk management programs and legislative reforms in patient compensation plans. Attention is given to medical and hospital malpractice experience, key legal decisions in the area, and legislative reform movements setting up arbitration, screening panels, tort-law changes, no-fault mechanisms, etc. Emphasizes the interrelationship of quality of care standards and quality assurance to malpractice vulnerability and risk management programs.

HPM 211cd. Advanced Seminar in Law and Public Health
Lectures, discussions, student presentations. *One 3-hour session each week. 5 units.* Dr. Curran, Guest Lecturers.
Provides an opportunity for law-trained students in the Program in Public Health for Lawyers and other qualified students to work together and exchange experiences in application of legal issues to current public health problems. The seminar is the focus for a legal research paper on a topic of health law mutually determined by student and instructor. Legal issues concentrate on matters of importance in representing health organizations in governmental and private sectors. Enrollment is subject to the approval of the instructor.

HPM 214d. Meta-Analysis of Clinical Trials and Their Impact on Medical Efficiency
Seminars, tutorials. *Two 1½-hour sessions each week. 2.5 units, plus additional units for tutorial.* Dr. Chalmers, Members of the Department.
Designed as a follow-up to BIO 214c. Concerned with the place of clinical trials in practice of preventive, diagnostic, and therapeutic medicine. Students learn to evaluate, conduct, coordinate, and combine clinical trials.
Related tutorials are conducted throughout the year. Students conduct meta-analysis in a field of their choice. Guidance and collaboration are given in searching literature for RCTs on diagnostic evaluations, gathering and analyzing data, and preparing abstracts for presentation at national meetings and publication of manuscripts in peer-review journals.
Prereq. An interest in the application of the scientific method to the prevention, diagnosis, and treatment of disease.

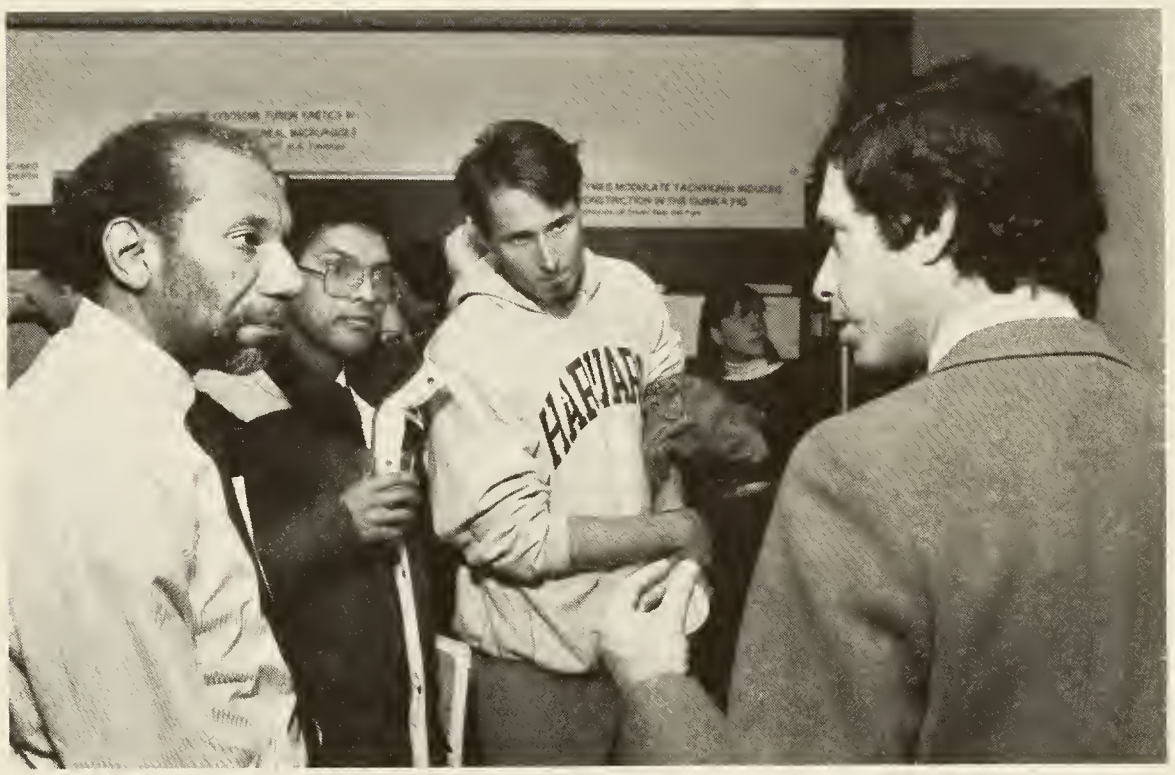
HPM 219a. Financial Transactions and Analysis
Lectures, seminars. *Three 2-hour sessions each week. 2.5 units.* Dr. Kane.
This is an intensive course which introduces concepts of financial accounting for the nonaccountant user of financial information. Basic accounting transactions, statement preparation, concepts of accrual accounting, accounting for capital, and

fund accounting are presented in the first half of the course. The second half focuses on statement analysis in a variety of decision-making situations common to health care organizations.
Enrollment is limited to 60 students.

HPM 220b. Financial Management and Control
Lectures, seminars. *Three 2-hour sessions each week. 2.5 units.* Dr. Kane, Dr. Siegrist.
The first part of the course introduces internal cost accounting systems for health service organizations, including full cost accounting and differential accounting concepts. Managerial control topics include responsibility structure, budgeting, reporting, and control systems. The financial management section focuses on management of cash flow, preparation of pro formas, capital budgeting, and project feasibility analysis.
Enrollment is limited to 60 students.
Prereq. HPM 219a.

HPM 221ab. Management in Public Health in Industrialized Countries
Lectures, seminars. *Two 2-hour sessions each week. 5 units.* Dr. Roberts.
Introduces the management of health delivery organizations in industrialized countries. Topics include organizational issues, financial management, cost accounting, management control systems, and institutional strategy. Combines cases, lectures, and speaker presentations, supplemented by topical readings, as a vehicle for analyzing management problems and evaluating alternative solutions. Introduces relevant managerial concepts and theories.

HPM 222ab. Management in Public Health in Developing Countries
Case discussions, lectures. *Two 2-hour sessions each week. 5 units.* Dr. Reich.
Introduces major issues and methods for understanding management in public health in developing countries. Examines key concepts of management, including organizational purpose and strategy, human resources development, organizational operations, budget and financial control systems, management information systems, and the external environment. Considers management in international agencies, the role of international consultants, and host country relations with aid agencies. Uses cases and readings appropriate to developing country context.
May be taken for credit by students who have previously taken either HPM 221ab or HPM 220ab/220cd only with the permission of the instructor.



Dr. Donald Shepard (right) discusses a Poster Day exhibit pertaining to health costs in developing countries with (from left to right) Visiting Professor Felton Earls, Dental School postdoctoral fellow Stephen Hendricks, and HSPH student Jeffrey Mecaskey.

HPM 229cd. Legal and Management Aspects of Health Care in the Workplace
One 3-hour session each week. 2.5 units. Dr. Curran, Mr. Moseley.
Introduces the full range of new health care issues confronting US employers: employee disabilities, alcohol and drug abuse, AIDS, fetal protection, medical screening, pregnancy and maternity benefits, job stress, smoking, employee assistance programs (EAPs), health promotion and employee wellness, and health care cost containment. Examines legal implications of these issues and suggests specific, practical policies and procedures for managing these issues to minimize employer cost and maximize employee health and productivity.

HPM 231c. Strategy Determination
Case discussions, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Sapienza.
Focuses on the framework needed to plan for the long-term viability of health care organizations. Using case studies, students analyze aspects of the strategy determination process, with the objective of building a heuristic foundation as well as the practical skills required for strategic planning.

HPM 233d. Health Care Marketing Applications
Seminars, case studies, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Kane, Mr. Wasek.
Examines various marketing applications in domestic health services, international underdeveloped areas, and social marketing contexts. Specific marketing techniques are addressed within a strategy framework.

HPM-EPI 237d. The AIDS Epidemic: Legal and Ethical Analysis
Lectures, case studies. *One 2-hour session each week. 1.25 units.* Dr. Curran, Dr. Mueller.
Uses the case method to analyze legislative and other legal developments in the United States and internationally that are designed to deal with the worldwide AIDS epidemic. Ethical problems including personal rights, confidentiality, and discrimination are also examined. Attention is given to current epidemiological factors impacting upon public health law and regulatory programs such as voluntary and mandatory screening, disease reporting, case finding, and contact tracing.

HPM 238c. Managing Management Information Systems
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.
Examines issues relating to effective management of computer-based management information systems. Although some technological issues are addressed on occasion, the principal focus of the course is on topics of systems analysis and design, MIS strategies, and organizational behavior, rather than technology. Uses case method instruction, supplemented by topical readings to focus on the role of a manager in assuring the success of an organization's MIS effort. Includes some international as well as US materials.

HPM 239a. Financial Analysis in Health Care
Not given 1989–90.
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Kane.
Provides the opportunity to develop advanced skills in financial accounting and analysis of financial reports. Covers fund accounting, accounting for inflation, analysis of financial statements, and funds flow. Cases draw on both hospitals and other nonprofit organizations.
Prereq. HPM 219a and HPM 220b or equivalent.

HPM 240a. Toward an Agenda for Public Health
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Roberts.
Provides an overview of the problems of setting priorities in public health. Examines the burden of illness in both advanced and developing societies and the causal role of environmental, economic, and behavioral factors. Discusses ways to measure the burden of ill health and alternative assumptions and implications. Examines ethical positions on how resources should be allocated, and the view of man and society they presume.

HPM 241b. Health Care Delivery in the US: History and Sociology
Not given 1989–90.
Lectures, discussions. *One 3-hour session each week. 2.5 units.* Members of the Department.
Offers an introduction to contrasting sociological and historical accounts of the US health care sector. Historical materials and contemporary case studies are used to analyze the roles of providers, patients, and other political, cultural, and social factors in determining the current objectives and institutional arrangements in this sector. The central role of physicians and "medical science" in health care is emphasized, and its implications for institutional reform explored.

HPM 242c. The Role of Government in the US Health Care System: Political Analysis
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. P. Feldman.
Introduces political analysis, using several models to examine the development and implementation of policies and programs affecting the US health care system. Topics include legislative politics, bureaucratic politics, and intergovernmental relations, as well as government's role in financing, delivering, and regulating health services.
Prereq. HPM 205ab or HPM 206ab or equivalent, by permission of the instructor.

HPM 243c. Health Economics: Economic Analysis of the Health Care System
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Hsiao.
Introduces health economics, using economic analysis to examine major health care financing and delivery issues, and the development of policies and programs designed to address them. Topics include health care financing, health care access and utilization, control of cost inflation, market structure, competition, and national health plans.
Prereq. HPM 205ab or HPM 206ab or equivalent.

HPM 246c. The Allocation of Health Resources
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Hiatt.
Considers the background of the problem of allocating health resources in the US and possible responses to its challenges. Discusses the stress placed on health resources by increasing medical capabilities, needs, and demands, and the disparity between what we can do and what we can afford to do.
Prereq. HPM 240a and permission of the instructor.

HPM 247d. Injuries and Public Policy
Seminars, case studies, lectures. *One 3-hour session each week. 2.5 units.* Dr. Hemenway.
Introduces students to the problem of injury, from a social science perspective. Discusses and analyzes approaches to understanding the problem, and policies to mitigate the consequences of both accidental and intentional injury. Specific categories of injury, such as fires, drowning, and motor vehicle collisions are examined in detail.
Prereq. HPM 240a and HPM 205ab or HPM 206ab, or equivalent preparation.

HPM 248cd. Business and Labor in the Health Care System
Seminars. *One 3-hour session each week. 2.5 units.* Dr. Blendon.
Examines changes in the health care system affecting doctors, hospitals, insurers, and government, through the perspective of the enhanced roles of business and labor organizations. Considers a series of topics, including the development of employment-based health insurance, current problems of access to health care, health care for retirees, and pending legislation in Massachusetts and the Congress.

HPM 255d. Reimbursement Systems
Seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Kane.
Examines issues related to the general theme of third-party reimbursement for health care institutions. The principal focus is on hospitals. Issues include cost containment efforts, hospital perspectives, and the role of incentives. Some specific systems are examined in detail in order to assess the feasibility of certain techniques and to address questions of overall reimbursement system design.
Prereq. Introductory courses in financial and cost accounting are recommended.

HPM 256c. Financing Health Care
Lectures, case studies. *Two 2-hour sessions each week. 2.5 units.* Dr. Hsiao.
Introduces the major public and private approaches to financing health care. Analyzes the economic considerations in financing: equity, efficiency, and stability. Evaluates impact of financing on access, risk pooling, cost inflation, and technology diffusion. Analyzes the stages of economic development and health care financing.
Prereq. HPM 205ab or HPM 206ab and permission of the instructor.

HPM 257c. Physician Performance
Seminar. *Two 2-hour sessions each week. 2.5 units.* Dr. Calkins.
Examines factors influencing physician practices and the quality of physician services. Issues discussed include the role of education, specialization, experience, organizational setting, financial incentives, and malpractice. Considers strategies for changing physician practices with respect to diagnostic testing, treatment, and patient education. Experience in medical care delivery is an advantage, but is not required.

HPM 258cd. Evaluation of Quality of Health Care
Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Dr. Palmer, Visiting Lecturers.
This course takes the student from the basic to the intermediate level in understanding of methods and programs for evaluation of the quality of health care. Subjects covered include data sources and standards, measurement theory, measurement of health outcomes and patient satisfaction, process and outcome review, quality measurement in special areas of medical care, the Peer Review Organization program, and the Joint Commission on Accreditation of Health Care Organizations.
Prereq. EPI 201a, BIO 201ab or HPM-BIO 203b, 203c, 203d (concurrent), or equivalent preparation.

HPM 262cd. Health Planning and Policy for Developing Countries
Lectures, seminars. *Two 2-hour sessions each week.*
Laboratory. *One 1-hour session each week* (optional). *5 units.* Dr. Shepard.
Deals with skills needed for health planning through lectures, problems, and case studies. Strong emphasis is placed on the economic analysis of health issues in developing countries. Concepts and techniques of cost-effectiveness analysis, recurrent cost analysis, and monitoring of the delivery of health services are taught, applied to health care programs, and practiced with examples. Class is divided into groups which use these techniques to analyze a planning problem and report their findings through presentations and a memorandum.
Prereq. ID 209a or experience in developing countries is recommended, but not required. A background in economics is not required.

POP-HPM 263c. Case Studies in Design and Management of Population and Community Health Programs
Case discussions, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Berggren, Dr. Strachan.
(Course described under Population Sciences.)

HPM 264b. Operations Management
Lectures, discussions. *One 3-hour session each week. 2.5 units.* Dr. Shepard.
Introduces, applies, and critiques the usefulness of quantitative techniques for designing and managing health programs. Important techniques (trend forecasting, critical path method, linear programming, queuing, and modeling) are developed through readings, cases, exercises, and use of relevant personal computer software (e.g., project management, spreadsheet, and simulation). Working in groups of two, students apply one of these techniques to a project of their choice.
Prereq. Permission of the instructor.

HPM 265d. Management Information Systems for Third World Health Systems
Lectures, discussion, case studies. *Two 2-hour sessions each week. 2.5 units.* Dr. Henn.
Explores the theoretical and practical concepts of information systems design. Begins with basic concepts of management, information theory, and systems analysis and proceeds to develop a general understanding of the design considerations of a MIS. Focuses on both public and private sector systems and on the "human side" of MIS implementation. Emphasizes MIS development for use by third-world health sector managers.
Primary course instructor is Joel Lamstein, CEO of John Snow, Inc.

HPM 266d. Managing Biomedical Science and Technology
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Sapienza.
Focuses on the complex interaction of industry structure, government policy, and organizational strategy. Exposes students to a range of institutional policy and management issues, using recent case studies of public sector biomedical research organizations and pharmaceutical companies in the US, Europe, and Japan. Aims to provide an understanding of the geopolitical context of biomedical research (especially therapeutic biotechnology) and derivative policy issues, and of current management practices dealing with scientific creativity and the leadership of research organizations.

HPM 267d. Political Economy of International Health Policy
Seminars, case discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Reich.
Examines critical health issues of developing countries in the larger international context of politics and economics. Explores how the relationships between developed countries and developing countries affect the management of health problems and policy. Students are introduced to two contrasting perspectives on development and health: modernization theory and dependency theory. Six case studies are discussed in class to illustrate the constraints and the opportunities created for health professionals by the international complexities of domestic health problems.

HPM 269b. Comparative Health Systems in Industrialized Societies
Lectures. *One 3-hour session each week. 2.5 units.* Dr. Field.
By comparatively examining a series of major health systems in industrialized societies, this course seeks to better apprehend shared structural features as well as critical differences. A national health system is the dialectic combination of (1) universal aspects of scientific and medical knowledge and techniques held to be valid anywhere and (2) the particular aspects of that nation's social structure and culture. This course attempts to point out how essentially the same problems can be approached in a variety of ways provided the student is aware that differences in social structures, political systems, and cultures limit transferability from one society to another.

HPM 270a. Issues in Mental Health Policy (KSG 177m)
Seminars, discussions. *One 3-hour session each week. 2.5 units.* Dr. Shore, Dr. Dorwart.
Reviews the historical development and current status of policy issues relevant to mental health and mental illness. Detailed attention is given to the role of government and to identifying areas where further research is needed.

HPM 274abcd. Dental Care Administration Research Seminar (HDS DCA 222)
Lectures, seminars. *One 3-hour session each week. 5 units.* Dr. Douglass (Harvard School of Dental Medicine).
The fall term concentrates on the research methods of current national studies of the need, supply, demand, and cost of dental care. Policy documents of the ADA, IOM, OTA, Research Triangle Institute, RAND Corp., and the NCHS are studied. Research designs and data collection methods are reviewed. The spring term emphasizes the research work of faculty and students on relevant dental care policy and management subjects. Grade is based upon participation and the defense of a current research project.

HPM 275ab. Dental Public Health and the Dental Care Delivery System
Seminars, case studies, lectures. *One 2-hour session each week. 2.5 units.* Dr. Antczak, Members of the Department.
Reviews basic concepts in dental public health and the dental care delivery systems in the US and other countries. Examines issues of utilization of services, need versus demand for dental care, methods of quality assurance, and the role of government agencies in the provision and regulation of dental care. The effects of alternative methods of financing dental care on utilization and provider incentives is also discussed.

HPM 276cd. Oral Diseases and the Evaluation of Dental Care
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Antczak.
Examines basic concepts in the epidemiology of oral diseases and reviews changes in disease prevalence. Discusses the measurement of oral health status and the translation of oral health status into treatment needs for planning purposes. Methods of evaluating dental care are also covered, including clinical decision making, research design, quality assessment of experimental evidence, and meta-analysis.

HPM 278s. Clinical Decision Analysis and Public Policy
Five 1¾-hour sessions each week for eight weeks. 5 units. Dr. Hiatt; Dr. Komaroff, Dr. Mulley, Dr. Epstein (Harvard Medical School).
Introduces the methods and applications of decision analysis, cost-effectiveness analysis, and cost-benefit analysis in the evaluation of clinical interventions, medical technologies, and health programs. Course emphasizes applications to treatment decisions and program evaluations. In addition, this course includes introductory material on microeconomic models, priority setting, cost accounting, and the organizational and policy contexts in which analytic techniques in a clinical setting are undertaken and interpreted.
Prereq. Permission of the instructor.

HPM 279c. Quantitative Policy Analysis
Seminars, case studies, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Graham.
Introduces students to techniques for analyzing health problems quantitatively. Techniques include decision analysis, cost-effectiveness analysis, and benefit-cost analysis. Readings from health, safety, and environmental literature are used to illustrate the techniques and their limitations. Emphasizes applications to health policy, planning, and management.
Prereq. HPM 205ab or HPM 206ab or equivalent.

HPM-BIO 280b. Decision Analysis for Health and Medical Practices
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Weinstein.
Concerns the methods and applications of decision analysis, cost-effectiveness analysis, and cost-benefit analysis in the evaluation of medical technologies and health programs. Stresses applications and limitations. Examples used to illustrate techniques include treatment decision for acute abdominal pain, coronary artery bypass surgery, cost effectiveness of pharmaceuticals, evaluation of immunization programs, and priority setting for applied biomedical research. Course emphasizes applications to medical technology assessment and health resource allocation.
Prereq. BIO 200ab or BIO 201ab or HPM-BIO 203b (may be taken concurrently) or equivalent introductory course in probability and statistics.

HPM-BIO 281c. Seminar on Clinical Decision Analysis
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Pliskin.
Intended to enhance the student's ability to conduct independent analyses of medical decisions. Didactic sessions critically review published analyses and address selected topics, such as evaluation of diagnostic tests, utility assessment, and use of computer aids.
Prereq. HPM-BIO 280b or permission of the instructor. Presumes knowledge of principles of decision analysis.

HPM-BIO 282d. Cost-Effectiveness and Cost-Benefit Analysis for Health Program Evaluation
Seminars, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Weinstein, Dr. Graham.
Topics include methods and applications of cost-effectiveness and cost-benefit analysis for health program evaluation, medical technology assessment, and environmental risk analysis; theoretical foundations; "shadow" pricing; economic valuation of life saving; choice of discount rates; cost accounting applied to economic evaluation in institutional settings; methods for assessing costs of environmental controls; distribution-sensitive measures of social benefit and cost; health status indexes; ethical issues; and modern critiques. Students prepare a written critique of a published analysis and develop an independent analysis plan of their own choice.
Prereq. HPM-BIO 280b or HPM 279c or equivalent; HPM 205ab or HPM 206ab or equivalent.

HPM-BIO 283b. Behavioral Decision Theory in Health
Not given 1989–90.
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.
Examines selected topics in the psychological study of how humans make decisions, with applications to medical decision making, health policy, health care management, and environmental decision making; subjective evaluation of probability and uncertainty; risk perception; framing effects; choice behavior; deviations from normative models; policy methods; the nature of human expertise; sources of variation in medical practices; and behavioral factors in the utilization and diffusion of technologies.

HPM-BIO 284ab. Topics in Health Decision Sciences
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Pliskin.
Presents selected topics in the theory and methods that underlie decision and risk analysis, including axiomatic foundations of expected utility theory, statistical decision theory, ROC analysis and diagnostic technology assessment, multiattribute utility theory, criticisms, alternatives, and research frontiers.
Prereq. HPM 280b or HPM 279c or equivalent; at least one semester of biostatistics beyond the introductory level; knowledge of elementary calculus and matrix algebra; permission of the instructor is required.

HPM 290ab, 290cd. Applied Research Seminar
Seminars. *One 2-hour session each week.* Field work. *One day each week. 5 units each semester.* Dr. Blendon, Members of the Department.
Teaches students to apply analytic and managerial methods to concrete problems. Each student defines and proposes solutions to an important problem confronting an institutional sponsor. Students learn research methods and problem-solving techniques during the "a" period while developing project contracts with sponsors. In subsequent seminar meetings, students, sponsors, and faculty advisers present and discuss study methods and findings. Students also meet individually with seminar faculty and designated faculty research advisers. Students prepare a "problem/methods" paper during the first semester, and final oral and written reports are due at the end of the year.

HPM 294b. Methodologic Issues in Health Services Research
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Kaplan.
This course is designed for students intending to pursue health services research. Emphasizes the array of methods available to researchers, their disciplinary origins, underlying assumptions, and strengths and weaknesses. For each topic, readings include an overview of the method, drawn largely from research methods texts, and specific examples from the literature.
Prereq. Permission of the instructor.

HPM 295bc. Doctoral Seminar on Research and Health Policy
Not given 1989–90.
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Blendon, Dr. P. Feldman.
Outlines the major research questions that relate to key issues of health policy. Reviews and critiques relevant research studies and discusses the design of research projects appropriate to specific policy questions. The seminar is not intended to explore technical statistical issues, but rather to place research and analysis in their social, institutional, and policy context.
Prereq. Enrollment in the Health Policy and Management doctoral program or similar background and experience.

HPM 296cd. Doctoral Seminar in Health Economics
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Hsaio.
Explores frontier work in the field of health economics. Focuses on learning advanced theories and economic models useful for policy analysis, and on helping students develop dissertation and/or research topics. Students enrolled for credit are expected to present original research at the end of the semester.
Prereq. Doctoral candidates or very advanced master's students (with instructor's permission); a graduate-level microeconomics course.

HPM 300abcde. Tutorials
Time and credit to be arranged.
Students may make individual arrangements to do work under the guidance of a member of the department. This work may include readings or special projects.

HPM 330e, 330f. Field Work
Time and credit to be arranged.
Students are assigned to work on special projects such as group surveys, other types of field projects, or observation of and limited participation in the work of health agencies. Field assignments are made on an individual basis to meet the needs of each student insofar as possible. Work in the field is coordinated with courses in the department and is offered through the Community Health Improvement Program.

HPM 350. Research
Doctoral candidates may register for HPM 350 to undertake individual study and research.

■ MATERNAL AND CHILD HEALTH

MCH 200b. Growth and Development I
Lectures, seminars, self-instructional material. *Two 2-hour sessions each week. 2.5 units.* Dr. Valadian.
Instruction in physical growth, development, maturation, and aging is presented in programmed, self-instructional material, and by weekly lectures. Emphasizes the growth of children in a population as an indicator of the general health and socioeconomic development of the population. Covers topics necessary for the advanced study of growth and maturization. Also provides an understanding of assets and needs which constitute a basis for health services.

MCH 202c. Growth and Development II: Factors Affecting Growth and Development
Lectures, seminars. *One 2-hour session each week. 1.25 units.* Dr. Valadian.
Explores definable influences that act on the course of physical growth and development from conception to maturity. Emphasizes understanding the nature of the factor and its direct effects, as well as on how factors interrelate to produce some characteristics of mature individuals. Considers implications of factors for planning and providing health services and for future research.

MCH 203e. Primary Maternal and Child Health Care
Seminars, lectures, field visits. *Full-day sessions. 1.25 units.* Dr. Gardner.
Introduces principles of organization and administration of primary health care services for mothers and children. Presents concepts of primary care, neighborhood health centers, and quality assurance. Seminars focus on the issues and problems presented in field visits to primary care programs. The community programs selected are diverse, including neighborhood health centers, private practice, hospital primary care, and HMO.
Enrollment is limited to 12 students.

MCH 204ab. Content of Maternal and Child Health Programs
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Guyer.
Components of health care programs for mothers and children are discussed in the context of growth and maturational processes, historical and legislative background, and social, mental health, and educational policies. Health programs appropriate to maternity, early and late childhood, adolescence, and youth are presented in terms of the multidisciplinary and interdisciplinary action they require. Includes discussion of factors which shape current and future maternal and child health policies and services. Topics include infant mortality and low birthweight, maternal health and mortality, care of handicapped children with special health care needs, early identification and intervention, child abuse, injury, and AIDS.

MCH 205cd. Planning, Implementation, and Evaluation of Maternal and Child Health Programs
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Gardner.
Considers the organization and administration of national, state, and local health programs for mothers, infants, children, and adolescents. Focuses on the development of skills in policy-formulation, needs assessment, planning, and evaluation of MCH programs in the US. Individual and small group projects are required.

MCH 206cd. Maternal and Child Health in Developing Countries
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Valadian.
Parallels MCH 205cd. Identifies the core elements of MCH services in developing countries and emphasizes factors which shape MCH programs in rapidly changing social and cultural environments, particularly the interactions between health, nutrition, and poverty. Case studies are used to underscore the interaction between health, other sectors, and political factors, and to illustrate the processes of planning, financing, implementing, managing, and evaluating programs.
Enrollment is limited to 15 students.

MCH-NUT 207cd. Nutrition in Child Growth and Development
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Dwyer.
Examines principles and practical problems encountered in the nutritional aspects of child growth and development. Lectures on general principles are designed to help students base their judgments on scientific evidence. Discussions deal with a variety of nutrition case studies and simulations illustrative of problems in both developing and highly industrialized countries.

MCH 208cd. Rural Health Services
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Gardner.
Lectures and discussions focus on the special problems of rural communities, including cultural characteristics, resources, and innovative approaches to problems. Emphasizes needs/demands assessments or community diagnosis which structure planning for the health needs in isolated communities. Topics include transportation problems, environmental health hazards, and other rural health concerns.

MCH 209c. Services for Children with Disabilities
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Crocker.
Provides a review of the handicapping conditions of childhood: mental retardation, physical disability, sensory and communication disorders, and emotional disturbance, as these affect development, adjustment, and family resources. The service system is analyzed with regard to health care, developmental support, education, residential options, and prevention.

MCH-BEH 210ab. An Introduction to Personality and Cognitive Development
Not given 1989–90.
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. D. Walker.
The basic principles of child growth and development in the cognitive and the psychosocial domains are examined in this introductory course. Special emphasis is placed on understanding the theories and research of Piaget, Freud, Erikson, and others, as well as the implications of these contributions to the planning and implementation of health and/or related social and educational services for children and youth.

MCH 211ab. Women and Health
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Gardner.
Addresses the major issues regarding women and their relationship to health worldwide, including the changing role of women in contemporary society. These health problems are addressed in terms of their epidemiology and the impact of technology on their detection and treatment. Issues are viewed from biological, medical, behavioral, cultural, and legal perspectives.

MCH 212c. Childhood Injuries: Epidemiological Principles and Control Strategies
Seminars, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Guyer, Ms. Gallagher.
Introduces students to the epidemiology of childhood injuries and the development of countermeasures for prevention. Discusses

methods for the study of injuries and evaluation of prevention programs. Considers specific topics, including motor vehicle injuries to children as occupants and pedestrians, injuries in the home, a developmental approach to childhood injury, injuries to adolescents, violence, and suicide. Complements material presented in HPM 247d.

MCH 213d. Obstetric Epidemiology
Lectures, seminars. *One 2-hour session each week. 1.25 units.* Dr. Sachs.
Tackles controversial issues in maternal health through techniques in epidemiology applied to obstetrics. Focuses on maternal mortality, obstetric and gynecologic morbidity, evaluation of obstetric health care, and populations at risk, such as pregnancies in women over 35. Examines the epidemiology of prematurity and current issues such as breast-feeding, home births, Caesarian sections, and fetal monitoring.

MCH 222c. Social Services for Children, Adolescents, and Families
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Deykin.
Presents the crucial role of social services in maintaining and promoting the health of children and their families. Beginning with a historical overview of social services in the US, the course examines current political trends which structure the content and delivery of social services, drawing comparisons with those in other countries. The social and psychological determinants of the need for social services focus on events of public health relevance, including terminal illness in childhood, adoption/foster care, family violence, day care, and services for children with HIV infection.

MCH-EPI 223b. Childhood Mental Disorders: Public Health Perspectives
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Deykin.
Examines the occurrence and known risk factors of selected mental disorders of childhood and adolescence, including autism, depression, hyperactivity, and anorexia. Emphasizes the methodologic issues of case definition, disorder classification, current diagnostic and screening instruments, and the advantages/disadvantages of available data sources. Readings include studies selected to illustrate methodologic options and usefulness for public health policy. Students are required to develop and present a research design on a childhood mental disorder of their choice.

MCH 300abcd. Tutorials
Time and credit to be arranged.
Students at the master's level may arrange to work individually or in small groups under the guidance of a faculty member. The work may include participation in departmental research, specialized readings, field projects in a local or state health agency, or small studies to examine more in-depth topics introduced in various courses such as planning and evaluation of MCH services for children with handicapping conditions. Tutorials are offered depending on students' interests and are limited by the amount of faculty time that is available. Arrangements must be made with individual faculty members.

MCH 330. Field Study
Field study is arranged on an individual basis to meet the special needs of each student insofar as possible.

Additional Field Study
Students who lack sufficient previous experience are encouraged to undertake a period of field study before registration or after completion of the academic year in a program arranged by the staff of the department. No credit is allowed for such field study.

MCH 350. Research
Doctoral students are required to undertake research in maternal and child health.

■ NUTRITION

NUT 201a/201b. Principles of Nutrition
Lectures. *Two 2-hour sessions each week. 2.5 units each period.* Dr. Storch, Members of the Department.
NUT 201a emphasizes basic concepts of nutrition, including relationships between nutrition and problems such as cancer and heart disease. NUT 201b provides a more detailed treatment of selected topics with emphasis on metabolic regulation.
NUT 201a may be taken separately, but NUT 201a (or permission of the instructor) is a prerequisite for NUT 201b.

NUT 204ab/204cd. Departmental Seminars
Seminars. *Two 1-hour sessions each week. 2.5 units each semester.* Dr. Sul, Members of the Department.
Students participate in and present seminars reviewing current research and publications related to nutrition in addition to attending advanced seminars presented by faculty and guest speakers. Beginning students learn skills required for oral presentations. Topics include both basic research and applied areas of nutrition.

NUT 205cd. Biochemistry and Physiology of Nutrition
To be given 1989–90; offered alternate years.
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Sul, Members of the Department.
The biochemistry and physiology of carbohydrates, fat, protein, vitamins, and minerals are integrated from the nutritional perspective. Course provides an in-depth analysis for students with a major interest in nutritional biochemistry.
Prereq. Course in biochemistry and permission of the instructors.

MCH-NUT 207cd. Nutrition in Child Growth and Development
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Dwyer.
(Course described under Maternal and Child Health.)

NUT 208cd. Nutritional Aspects of Human Disease
Lectures, case presentations, discussions. *One 2-hour session each week. 2.5 units.* Dr. Herrera-Acena, Mrs. Witschi.
Reviews the role of diet in the causation and management of clinical obesity, diabetes mellitus, coronary artery disease, anemia, liver disease, alcoholism, gastrointestinal disorders, and renal disease. Early detection and prevention of these nutrition-related disorders are considered.

NUT 209cd. Food Science and Nutrition
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Mrs. Witschi, Dr. Samonds, Members of the Department.
Deals with nutrition in terms of the foods which supply mankind's nutrient needs, their composition and physical properties, and the positive and negative effects on nutrient qualities of food of genetic manipulation, agricultural practice, processing, storage, and cooking. The historical development of food technology, including methods of preservation and sanitation, is related to current methods employed in both developing and industrialized countries.

NUT 210cd. Nutrition Problems of Less-Developed Countries
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Herrera-Acena.
The nutrition problems of less-developed countries are discussed in the context of basic human needs. The ecology and the biological and behavioral consequences of malnutrition are reviewed in detail. Special emphasis on issues in human biology relevant to the formulation of nutrition policy and programs.

NUT 214ab/214cd. Research Techniques in Nutritional Biochemistry
Lectures. *One 1-hour session each week.* Laboratory. *Fifteen hours minimum each week. 5 units each semester.* Dr. Storch, Members of the Program in Nutritional Biochemistry.
Students rotate through the laboratories (one each period) of faculty members in the Nutritional Biochemistry Program in order to learn current techniques applied to nutritional, cellular, and biochemical research. Weekly lectures emphasize the theory behind the instrumentation utilized in the laboratory. Students present oral and written reports on the research they have accomplished to the Nutrition faculty as required.
Generally limited to students in the Department of Nutrition.

NUT-EPI 216ab. Nutritional Epidemiology
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Willett, Mrs. Witschi.
Reviews methods for assessing dietary intakes of populations and individuals. Students gain experience in the actual collection, analysis (including conversion to nutrients by computer), and interpretation of dietary intakes. Case studies follow, involving specific diet/disease relationships integrating information from international studies, secular trends, clinical trials, analytical epidemiology, and animal experiments.
Prereq. BIO 200ab or BIO 201ab, EPI 200a or EPI 201a, and permission of the instructor for students who have not taken a course in nutrition.

NUT 300abcde. Tutorial Programs
Time and credit to be arranged.
Individual work under direction may be arranged. This can include laboratory studies, projects in applied nutrition, library research, or the following special topic.

301 *Nutrition and Health Promotion in the Mass Media*
Dr. Goldman, Dr. Cheung.
The role of the mass media in the promotion and adoption of healthy eating practices; extent and quality of coverage in various mass media outlets; creating messages for mass media use; effectiveness of existing mass communication campaigns in nutrition.
Prereq. NUT 201a/201b or equivalent; background in behavioral sciences or education.

NUT 352-370. Research
Time and credit to be arranged.
Facilities are available for doctoral students to do advanced work in nutrition along the lines of fundamental or applied research as related to public health and medicine. Areas currently receiving intensive and comprehensive study in the department are as follows:

352 Dr. Goldman.
The metabolism of food constituents and drugs, particularly as carried out by intestinal bacteria. Emphasis given to areas of metabolism that may help to understand a compound's biological activity.

353 Dr. Lown.
Coronary artery disease; etiology of sudden death; derangements of the heart beat; exercise physiology; electrolyte metabolism.

356 Dr. Antoniades.
Regulation of cell growth by hormonal growth factors derived from human serum or platelets; platelet-derived growth factor and atherogenesis; mechanisms of hormone transport and regulation.

358 Dr. Herrera-Acena.
The role of nutrition and other environmental factors in the etiology and management of diabetes mellitus; the relationship of malnutrition to physical and cognitive development.

363 Mrs. Witschi.
Computer-based interactive dietary history, analysis, and counseling programs.

364 Dr. Reinhold.
Structural characterization of glycoconjugates on biosurfaces by high performance liquid chromatography, gas chromatography, and mass spectrometry.

369 Dr. Sul.
Regulation of lipogenic and glycolytic enzymes by hormonal and nutritional factors and alteration of this regulation in the diabetic state.

370 Dr. Storch.
Regulation of lipid transport and membrane composition.

Admission limited and subject to approval of the instructor.

■ POPULATION SCIENCES

POP 191ab. Cities and Regions (Sociology 191)
Lectures. *Two 1-hour sessions each week. 5 units.* Dr. Alonso.
Stresses the interaction of societies and their geographies, focusing primarily on historic and current developments in the United States. Considers demography, technology, institutions, ideology, health, the economy, and other factors.

POP 200ab. Introduction to Population Sciences
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Chen, Dr. Mertens.
Reviews the basic elements of population change—fertility, mortality, and migration—and their interaction with social, cultural, and economic characteristics of societies for both developed and developing countries. Introduces basic demographic concepts and methods, including demographic rates and the life table.

POP 202cd. Student Project Design Seminar
Seminars. *One 2-hour session each week. 5 units.* Dr. Levins.
Oriented toward health and population problems of communities. Each student selects a community and an appropriate health or population problem. He/she presents a critical survey of the relevant literature and a project design, to amplify understanding of the relative frequency of the selected problem in relation to other health or population problems of the community, and to increase or test the available knowledge of causes of the problem.
Prereq. POP 217b; introductory courses in biostatistics and epidemiology. Enrollment after interview with the instructor.

POP 204cd. Biological Basis for Fertility Control
Lectures. *Three 1-hour sessions each week. 5 units.* Dr. Salhanick.
Presents the fundamental physiology and biochemistry of known and potential methods of family planning. Topics include the biosynthesis, secretion, and actions of the gonadal, gonadotropic, and hypothalamic hormones, the relationship of the natural steroid hormones to synthetic analogues, and regulation of the menstrual cycle. A short paper or presentation may be required.
Prereq. Appropriate science background or permission of the instructor.

Dr. Rose Frisch, Associate Professor of Population Studies, authored a study on the decreased risk of breast cancer and cancers of the reproductive system for women who were college athletes.

POP 205ab. Introduction to Demographic Analysis
Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Members of the Department.
Reviews fundamentals of the measurement and analysis of mortality, nuptiality, fertility, population growth, and age structure. Topics include sources of demographic data, demographic rates, cohorts and periods, model life tables and models of nuptiality and fertility, stable population theory, and population projections. Students will have the opportunity to analyze the demographic future of selected countries such as the United States, Mexico, and China.

POP 206cd. Demographic Methods for Field Research in Developing Countries
Seminars. *Two 2-hour sessions each week. 5 units.* Members of the Department.
Introduces the wealth of demographic surveys and censuses available for developing countries, and reviews procedures for analyzing these data, including indirect techniques for use with limited or faulty data. After covering the basic methods for the estimation of infant, child, and adult mortality, and age-specific fertility rates, attention is given to a selected number of current topics such as the influence of birthspacing on child survival, the demographic impact of treatment for vitamin A deficiency, and mortality from AIDS in Africa. Class exercises will involve using SAS to process a recent survey.
Prereq. An introductory course in population.

POP 207ab. Social Science Approaches to Population Change
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Chen, Dr. Mertens.
Reviews major contributions and debates in the social sciences with respect to theories of population change and causes of fertility, mortality, and migration. Focuses both on historical European experience and on societies in the contemporary developing world. Short papers are required.

POP 210cd. Ethical Components of Health Care Decision Making
Lectures, discussions. *One 2-hour meeting each week. 2.5 units.* Dr. Dyck.
Introduces students to major modes of moral reasoning as these are found in ethics and in health care policies. Topics include ethical theory, the use of humans in research, medical screening, population policy, care for the dying, surrogate motherhood, and the allocation of scarce medical resources. Readings are taken from philosophical, medical, and legal scholarship, as well as official documents of governmental and non-governmental agencies.

POP 216ab. Comparative Analysis of Public Policies in Developing Countries (KSG S-552, Government 2110)
Lectures, seminars, workshops. *One 2-hour session each week. 5 units.* Dr. Montgomery (John F. Kennedy School of Government).
Examines patterns of policy making across cultures and issue areas, including interactions between policies and social contexts.

Surveys third-world policies for dealing with such problems as population (fertility and migration), malnutrition, land reform, and management of large-scale irrigation systems. Applies the policy sciences approach to the formulation and implementation of large-scale programs of public intervention in social processes.

POP 217b. Introduction to Community Health Assessment in Developing Countries Through Community Epidemiology
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Berggren.
Illustrates and analyzes the population-based community approach to understanding the health problems of a community. Applies at the community level basic principles of epidemiology and demography, and of biological, social, and behavioral ecology. Participants learn how the basic determinants of community-based measurements of risks of sickness, death, birth, and migration form the foundation for setting priorities for health programs appropriate to the community. Provides a strategy to practice community health, to document the impact of programs, and to involve the community in these processes. Reviews and analyzes classic population-based community studies in depth.

POP 220d. Human Ecology
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Levins.
Provides a broad overview of the human ecosystem as it emerges out of, but is different from, pre-human ecology. Topics are selected from biosphere processes, population interaction, agricultural systems, adaptation, ecological politics, and evolution. Also considers the role of knowledge and conscious planning as an aspect of human ecology and examines approaches toward the solution of ecological problems.
Prereq. Basic knowledge of biology.

POP 222cd. Sex Differentials in Health and Mortality
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Chen, Dr. Obermeyer.
Reviews the evidence for sex differences in health status, health risk, and mortality from relevant studies in the demographic, epidemiological, and social science fields. Examines such phenomena as excess female mortality, preferential treatment, and changes in the sex ratio, using a comparative perspective, both historical and cross cultural. Discusses the possible explanations for sex differences in morbidity and mortality in terms of biological, demographic, social, and cultural factors and their implications for the health of populations.

POP-HPM 263c. Case Studies in Design and Management of Population and Community Health Programs
Case discussions, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Berggren, Dr. Strachan.
A managerial perspective on the problems of developing and implementing population and primary health care programs in third-world nations. Problems are examined from the level of managers of clinics and of community and national programs. Topics are covered primarily through case studies based on family planning and primary health care programs, particularly at the community and regional levels.

POP 270cd. Graduate Seminar in Policy and Research Issues in International Health and Population Sciences
Seminars. *One 3-hour session each week. 5 units.* Dr. Chen, Professor Emeritus Bell.
This course is a graduate seminar for doctoral students in Population Sciences with international health interests, or master's students with international health experience and strong interest in research in international health and population sciences. Students are exposed to important policy questions involving a variety of international health issues, with an emphasis on current research.
Prereq. Doctoral students in Population Sciences. In exceptional cases (as assessed by the instructor), MPH or SM students with extensive field experience and strong research interests may be permitted to enroll.

POP 300abcd. Tutorial Programs
Time and credit to be arranged.
Students at the master's level may make arrangements for tutorial work and special reading on topics related to population problems. There may be an opportunity to consider the design of studies, programs, or analysis of data.

POP 330e/330f. Field Studies
Field Trip to Haiti or the Dominican Republic. Dr. Berggren.
The objective of this field study is to provide exposure to the urban, rural, and development problems of a developing country. Students visit the homes of rural farmers to observe the living conditions of these families and their accessibility to health care facilities and programs. Students also see rural health centers, health surveillance teams, nutrition programs, and the headquarters of various health programs. What has been observed, how it relates to data previously collected, and what programs can be developed to improve the conditions are then discussed with the group's leaders and with local health planners. Students are required to give a talk to Haitian or Dominican colleagues and to write a report at the end of the trip.
The field trip is held during the week between the fall and spring semesters or the week between the two halves of the spring semester; the week chosen is at the discretion of the tour directors. Students must sign up for the course with the department by October 13. Partial financing of the course is the responsibility of the student and should be arranged as early as possible in the academic year.
Enrollment is limited to 10 and is subject to the approval of the instructor.

POP 350-356. Research
Time and credit to be arranged.
Candidates for doctoral degrees may undertake research in the department or may integrate research in population sciences with a doctoral program in another department or at the Center for Population Studies.
Members of the department and of the Center for Population Studies are currently engaged in research in the following areas:

351 *Biomedicine and Reproductive Physiology*
Dr. Salhanick.

353 *Population Ethics*
Dr. Dyck.

354 *Biological Determinants of Fertility*
Dr. Frisch.

355 *Complex Systems*
Dr. Levins.

■ TOXICOLOGY

TOX-ESP 204ab. Principles of Toxicology
(HMS BCMP 713, FAS BCMP 218)
Lectures, seminars. *Two 2-hour sessions each week.*
Discussions (optional). *One 2-hour session each week. 5 units.* Dr. Schlegel, Dr. Kelsey, Members of the Department.
Emphasizes mechanisms of injury and clinical consequences following exposures to environmental and occupational chemicals. Actions are examined at the molecular, cellular, organ, and organismal levels. Methods for detecting and evaluating toxic effects of environmental and industrial chemicals are discussed, as are perspectives on the scientific basis for risk estimation in humans.
Prereq. Organic chemistry and mammalian physiology or permission of the instructor.

TOX 208ab/209cd. Seminar in Toxicology
Seminars. *One 1-hour session each week. 1 unit each semester.* Dr. Samson, Members of the Laboratory.
Includes seminars, journal clubs, and discussions of topics in basic research and the current literature in toxicology.
Prereq. Background in toxicology or related fields and permission of the instructor.

TOX 210ab/211cd. Advanced Toxicology
Laboratory with discussions, seminars, and assigned readings as appropriate. *To be arranged. 5 units.* Dr. Tashjian, Members of the Laboratory.
Examines experimental methods of research in toxicology. Includes individual laboratory work.
Prereq. TOX-ESP 204ab or equivalent and permission of the instructor.

TOX 300abcd. Tutorial Programs
Time and credit to be arranged.
Dr. Tashjian, Members of the Laboratory.
Opportunities are provided for tutorial work in molecular, cellular, biochemical, and environmental toxicology.
Prereq. Permission of the instructor.

TOX 350. Research
Doctoral candidates may undertake laboratory research in toxicology under the direction of a faculty member.
Dr. Tashjian, Dr. Farr, Dr. Ofner, Dr. Samson, Dr. Schlegel, Dr. Toscano.

■ TROPICAL PUBLIC HEALTH

TPH 201a. Ecology, Epidemiology, and Control of Important Parasitic Diseases of Developing Areas
Lectures, seminars, demonstrations. *Two 1-hour sessions and one 2-hour session each week. 3 units.* Dr. David, Dr. Maguire, Members of the Department, Guest Lecturers.
Provides an introduction to ecological and epidemiologic concepts basic to the control of infectious agents. Considers important parasitic diseases of particular significance in the developing areas of the world. Epidemiologic principles of vector-associated diseases are elucidated through study of entities such as malaria and schistosomiasis.
Prereq. Prior knowledge of the pathogenesis of disease produced by infectious agents is desirable.

TPH 202b. Epidemiology of Infectious Diseases of Public Health Importance in Developing Countries
Lectures, team meetings. *Two 2-hour sessions each week. 2.5 units.* Dr. Cash, Guest Lecturers.
Thoroughly reviews the epidemiology of infectious diseases of public health importance in developing countries. Emphasizes epidemiologic patterns of bacterial and viral diseases as they relate to different geographic and socioeconomic environments. Stresses methods of disease surveillance, especially with regard to prevention and control. Case studies are extensively used with student teams proposing solutions to the problems.
Enrollment is limited to 40.
Prereq. Background in health care delivery or permission of the instructor.

TPH 203b. Mycobacterioses
Lectures. *One 2-hour session each week. 1.25 units.* Dr. Piessens, Dr. Koch-Weser, Guest Lecturers.
Covers the immunobiology of mycobacteria and worldwide epidemiology, clinical diagnosis, and treatment of tuberculosis, leprosy, and diseases caused by other mycobacteria. Also deals with laboratory diagnosis, BCG vaccination, chemoprophylaxis, prevention, and tuberculosis control in Massachusetts, the US, and other countries.

TPH 204c. Introduction to the Techniques of Investigation of Parasitic Infections
Lectures, seminars. *Two 3-hour sessions each week.*
Laboratory. *One 2-hour session each week. 5 units.* Dr. Pan.
Emphasizes basic laboratory methods for the study of parasitic diseases of public health importance. Provides exposure to theory and application of techniques essential to epidemiologic and laboratory investigation. Life cycles of several parasites are maintained and examined with respect to detection and quantification of infection, immunity, and control.
Enrollment is limited to 15 and subject to approval of the instructor. Preference given to concentrators in tropical public health.

TPH 205c. Clinical and Pathologic Features of Tropical Diseases
Case presentations, clinico-pathologic conferences, demonstrations. *One 2-hour session each week. 1 unit.* Dr. Maguire, Dr. Dammin, Dr. Franz von Lichtenberg (Harvard Medical School), Members of the Department, Members of the Pathology Department.
Designed for students particularly interested in tropical medicine. Emphasizes the clinico-pathologic aspects of tropical diseases. At each session, disease entities are introduced by presenting a clinical case, and pertinent clinical and pathologic features of the disease are then reviewed.
Prereq. Prior knowledge of pathogenesis and clinical features of infectious diseases.

TPH 206d. Principles of Public Health Entomology
Lectures, laboratories, seminars, field trips. *One 3-hour session each week. 2.5 units.* Dr. Spielman, Dr. Ribeiro.
The manner in which arthropods transmit disease and the principles of vector control are discussed from ecological, physiological, and genetic points of view. Class sessions introduce concepts and techniques currently employed in controlling vector-borne disease. Weekend field trips provide an opportunity for students to apply skills acquired in the classroom.
Prereq. TPH 201a or suitable biology background and permission of the instructors.

TPH 207c. Principles of Vector Physiology
Lectures, discussions. *One 1-hour session and one 2-hour session each week. 1.25 units.* Dr. Ribeiro.
Presents the physiology of blood-sucking arthropods. Aims to provide the student with an interest in arthropod-borne diseases and a base of insect physiology that will enable a comprehensive view of the interaction between pathogen/vector at a biochemical/physiological level. Each session requires reading up to five papers in the literature and writing answers to problem sets.
Prereq. Background in biology and biochemistry and permission of the instructor.

TPH 208d. Current Problems in Schistosomiasis
Lectures, seminars. *One 2-hour session each week. 2 units.* Dr. Chernin, Members of the Department.
Presents the problems posed by schistosomiasis as an expanding health hazard. Emphasizes the biology of snail vectors, problems of assessment of significance of the disease, and the potentials of various approaches to control.
Prereq. TPH 201a or permission of the instructor.

TPH 210c. Current Problems in Malariology
Not given 1989–90.
Lectures, seminars. *One 2-hour session each week. 2 units.* Dr. Spielman, Members of the Department.
Reviews the biology of the malaria parasite, emphasizing factors that particularly affect transmission and human morbidity and mortality. Introduces the principles of malariometry and the strategies for controlling malaria. Analyzes current control programs in seminar discussions.
Prereq. TPH 201a and permission of the instructors.

TPH 216cd. The Biology of Parasitism
(HMS Imm. 721.0, FAS Imm. 214)
Lectures, discussions. *One 3-hour session each week. 2.5 units.* Dr. Harn, Dr. Titus, Members of the Department, Guest Lecturers.
Covers aspects of the biology, immunology, and molecular biology of various protozoa and helminths. Includes discussion on the mechanism of immune evasion, mechanism of antigenic variation, and the biology and immunology of malaria, schistosomes, filariae, leishmania, amoeba, and trypanosomes. Each session requires reading three or four papers in the literature and writing answers to problem sets.
Prereq. Suitable course in basic immunology and biology and permission of the instructors.

TPH 220b. Basic Concepts in Immunology
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Harn, Dr. Piessens.
Presents basic concepts in immunology. Covers most of the defined humoral and cellular components of the immune system. This information is taken from readings and discussion of selected papers in the literature which present key findings on how the various components of the immune system function.
Prereq. Permission of the instructors.

TPH 224d. Field Methods for Developing Countries: Epidemiology, Surveys, Program Evaluation
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Members of the Department, Guest Lecturers.
Presents principles and methods for performing research in third-world field settings. Although these topics are germane for industrialized nations, readings and presentations focus exclusively on practical versus theoretical issues in international health. Matters of primary importance include threats to valid inference, program planning, survey construction, sampling methods (cluster sampling, LQAS, simple random sampling), anthropometry, dietary measures, training, data management, program evaluation design, and cost-effectiveness analyses.

TPH 300abcde. Tutorial Programs
Laboratory exercises. *Time and credit to be arranged.*
Individual work for candidates at the master's degree level may be carried out under supervision of a member of the department. Various parasites of medical importance are maintained and are available for studies on immunology, molecular biology, cell biology, biochemistry, and chemotherapy. Arrangements are subject to the approval of the instructor.

TPH 350. Research
Doctoral candidates or qualified full-time special students may undertake original investigations in the laboratory or in the field by arrangement with the chairman of the department.
Members of the department are currently engaged in the following areas of research:

Biology, host-parasite relationships, and control of protozoa and helminths

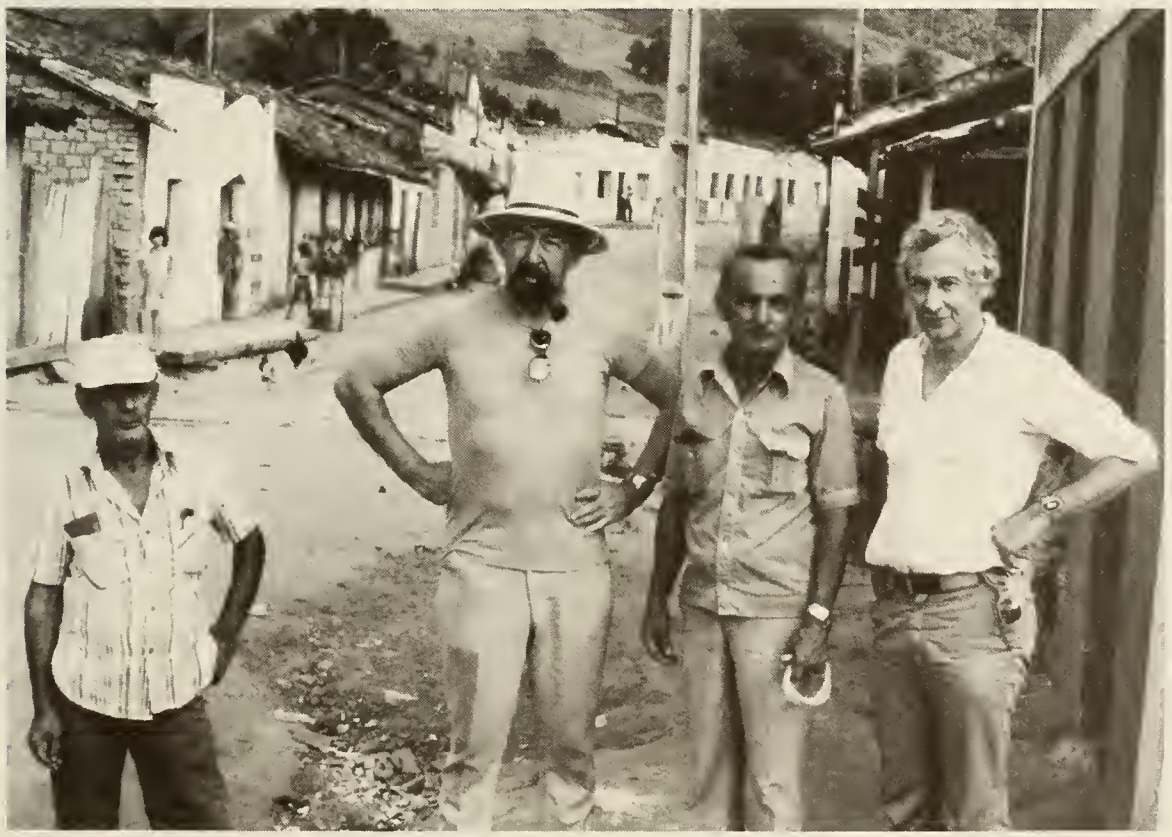
Population genetics, nutrition, and reproduction of medically important arthropods

Immunology of protozoa and helminths

Molecular biology of protozoa and helminths

Arthropod transmission of viral, protozoan, and helminthic agents

Cultivation in vitro *of parasitic helminths and protozoa of medical importance*



Dr. John David (right), Chairman of the Department of Tropical Public Health, visits a project in Brazil. With him are British parasitologist Philip Marsden (second from left) and field workers.

ADMINISTRATION AND MEMBERS OF THE FACULTY

Dean Harvey V. Fineberg

■ PRESIDENT AND FELLOWS OF HARVARD COLLEGE

(This board is commonly known as the Corporation.)

Derek Bok, AB, JD, AM, LLD, President

Charles Pence Slichter, AB, AM, PhD, Fellow of Harvard College

Robert Gregg Stone, Jr., AB, Fellow of Harvard College

Colman Mockler, Jr., AB, MBA, Fellow of Harvard College

Henry Rosovsky, AB, AM, PhD, LLD, LHD, Fellow of Harvard College

Judith Richards Hope, AB, JD, Fellow of Harvard College

Robert Shenton, AB, MBA, PhD, Secretary to the Corporation

■ ADMINISTRATIVE OFFICERS OF THE SCHOOL OF PUBLIC HEALTH

Derek Bok, AB, JD, AM, LLD, President of Harvard College

Harvey Vernon Fineberg, AB, MD, MPP, PhD, Dean of the Faculty of Public Health

Richard James Cannon, BS, MBA, Dean for Administration

Dade William Moeller, SB, SM, PhD, Associate Dean for Continuing Education

Ann Rosenthal Oliver, AB, EdM, MPH, Associate Dean for Academic Administration and Affirmative Action Officer

Ruth Heather Palmer, BA, MB, BCh, SM, Associate Dean for Students

Patricia Burton Jacoby, Assistant Dean for Development

John Harold Lichten, AB, MSW, Assistant Dean for Administration

Norman Henry Peterson, Assistant Dean for Administrative Services

Jay Andrew Winsten, AB, PhD, Assistant Dean for Public and Community Affairs

Bernita L. Anderson, AB, AM, Director of Professional Development

Hanna Machlup Hastings, AB, AM, EdM, Director of Student Affairs

Judith Eileen Hull, BMus, MMus, Registrar and Director of Admissions

Laura Markowitz Till, AB, EdM, Director of Financial Aid

■ MEMBERS OF THE FACULTY

William Alonso, AB, MCP (Harvard University), PhD (University of Pennsylvania); Richard Saltonstall Professor of Population Policy (*Population Sciences*).

David Alan Amato, AB (Colgate University), MS, PhD (Cornell University); Lecturer on Biostatistics (*Biostatistics*).

Mary Ochsenhirt Amdur, SB (University of Pittsburgh), PhD (Cornell University); Adjunct Associate Professor of Toxicology (*Environmental Science and Physiology*); *Lecturer, Massachusetts Institute of Technology.*

James Robert Anderson, AB (State University of New York at Buffalo), PhD (University of Washington); Associate Professor of Biostatistics.

Harry Nicholas Antoniades, BS, PhD (Athens University); Professor of Biochemistry (*Nutrition*); *Senior Investigator, Blood Research Institute, Inc., Boston.*

Robert Bruce Banzett, SB (Pennsylvania State University), PhD (University of California, Davis); Associate Professor of Physiology (*Environmental Science and Physiology*).

Diana Barrett, AB (Sweet Briar College), SM (Boston University), MBA, DBA (Harvard University); Lecturer on Management (*Health Policy and Management*) (on leave 1989–90).

Gretchen Mary Berggren, AB (Nebraska State College), MD (University of Nebraska), SM in Hyg (Harvard University); Lecturer on Population Sciences.

Donald Mark Berwick, AB, MPP, MD (Harvard University); Member of the Faculty of Public Health (*Health Policy and Management*); *Associate Professor of Pediatrics, Harvard Medical School.*

Robert Jay Blendon, BA (Marietta College), MBA (University of Chicago), MPH, DSc (The Johns Hopkins University), AM (hon.) (Harvard University); Professor of Health Policy and Management.

Elkan Rogers Blout, AB (Princeton University), PhD (Columbia University), AM (hon.) (Harvard University), DSc (hon.) (Loyola University); Professor in the Faculty of Public Health and Director of the Division of Biological Sciences; *Edward S. Harkness Professor of Biological Chemistry, Harvard Medical School.*

Joseph David Brain, AB (Taylor University), SM, SM in Hyg, SD in Hyg (Harvard University); Cecil K. and Philip Drinker Professor of Environmental Physiology and Professor of Physiology (*Environmental Science and Physiology*).

Peter Braun, SB (Yale University), MD (Columbia University); Lecturer on Public Health (*Health Policy and Management*).

William Alfred Burgess, SB (Tufts University), SM (Harvard University); Associate Professor of Occupational Health Engineering (*Environmental Science and Physiology*); *Corporate Manager of Industrial Hygiene, Polaroid Corporation.*

James Preston Butler, AB (Pomona College), AM, PhD (Harvard University); Adjunct Associate Professor of Biomathematics (*Environmental Science and Physiology*).

John Cairns, MD, BA, BM, BCh, DM (Oxford University), AM (hon.) (Harvard University); Professor of Microbiology (*Cancer Biology*).

John Charles Caldwell, BA (University of New England, Australia), PhD (Australian National University); Adjunct Professor of Population Sciences; *Professor and Chairman, Department of Demography, Australian National University.*

David Ross Calkins, AB (Princeton University), MD, MPP (Harvard University); Assistant Professor in the Department of Health Policy and Management; *Assistant Professor of Medicine, Harvard Medical School.*

Richard James Cannon, BS, MBA (Boston College); Member of the Faculty of Public Health and Dean for Administration.

Richard Alan Cash, SB (University of Wisconsin), MD (New York University), MPH (The Johns Hopkins University); Lecturer on Tropical Public Health (*Population Sciences* and *Tropical Public Health*) and Director of the Program for Professional Education in International Health; *Institute Fellow, Harvard Institute for International Development.*

Jacqueline Ann Cattani, MA (University of California, Santa Barbara), MPH, PhD (University of California, Berkeley); Assistant Professor of Tropical Public Health and Epidemiology (*Tropical Public Health* and *Epidemiology*) (on leave 1989–90).

John Philip Caulfield, BS (Loyola College), MD (University of Maryland); Associate Professor in the Department of Tropical Public Health; *Associate Professor of Pathology, Harvard Medical School.*

Lincoln Chih-ho Chen, AB (Princeton University), MD (Harvard University), MPH (The Johns Hopkins University); Taro Takemi Professor of International Health (*Population Sciences*) and Director of the Center for Population Studies.

Eli Chernin, SB (College of City of New York), AM (University of Michigan), SD (The Johns Hopkins University), AM (hon.) (Harvard University); Professor of Tropical Public Health.

David Christopher Christiani, BS (Fairfield University), SM, MPH (Harvard University), MD (Tufts University); Assistant Professor of Occupational Medicine (*Environmental Science and Physiology*).

Paul David Cleary, SB, SM, PhD (University of Wisconsin); Associate Professor in the Department of Behavioral Sciences; *Associate Professor of Social Medicine, Harvard Medical School.*

Earl Francis Cook, BA (Providence College), MA (University of Massachusetts), SM, SD (Harvard University); Associate Professor of Epidemiology; *Associate Biostatistician, Brigham and Women's Hospital.*

Allen Carrol Crocker, AB (Massachusetts Institute of Technology), MD (Harvard University); Associate Professor in the Department of Maternal and Child Health; *Associate Professor of Pediatrics, Harvard Medical School.*

Allen Latham Cudworth, BEE (University of Alabama), MEE (Massachusetts Institute of Technology), SD in Hyg (Harvard University); Adjunct Lecturer on Applied Acoustics and Environmental Health (*Environmental Science and Physiology*); *Vice President of Liberty Mutual Insurance Company and Director, Hopkinton Research Center.*

William John Curran, JD (Boston College), LLM, SM in Hyg (Harvard University), LLD (hon.) (New York Law School); Frances Glessner Lee Professor of Legal Medicine in the Faculty of Medicine and the Faculty of Public Health (*Health Policy and Management* and *Maternal and Child Health*).

John Rouben David, AB (College of the University of Chicago), MD (University of Chicago), AM (hon.) (Harvard University); John LaPorte Given Professor of Tropical Public Health; *Professor of Medicine, Harvard Medical School.*

Victor Gerard DeGruttola, BS (Brown University), SM, SM, SD (Harvard University); Assistant Professor of Biostatistics.

Richard Dennis, SB (Northeastern University), SM (Harvard University); Associate Professor of Applied Environmental Health Engineering (*Environmental Science and Physiology*); *Director, Pollution Control Laboratory, G.C.A. Corporation, Bedford.*

Eva Yona Deykin, AB (Radcliffe College), SM (Simmons College), MPH, DrPH (Harvard University); Lecturer on Maternal and Child Health.

Douglas William Dockery, BS (University of Maryland), MS (Massachusetts Institute of Technology), SM, SD (Harvard University); Assistant Professor of Environmental Science and Physiology.

Jeffrey Mark Drazen, SB (Tufts University), MD (Harvard University); Associate Professor of Physiology (*Environmental Science and Physiology*); *Associate Professor of Medicine, Harvard Medical School.*

Johanna Todd Dwyer, SB (Cornell University), SM (University of Wisconsin), SM in Hyg, SD in Hyg (Harvard University); Adjunct Professor of Maternal and Child Nutrition (*Maternal and Child Health*); *Professor of Medicine and Community Health and Director, Stern Nutrition Center, Tufts Medical Center.*

Arthur James Dyck, AB (Tabor College), AM (University of Kansas), PhD (Harvard University); Mary B. Saltonstall Professor of Population Ethics (*Population Sciences*); *Member of the Faculty of the Harvard Divinity School* (on leave to February, 1990).

Felton James Earls, BS, MD (Howard University); Visiting Professor in the Department of Behavioral Sciences (*Behavioral Sciences* and *Maternal and Child Health*); *Blanche F. Ittleson Professor of Child Psychiatry, Washington University School of Medicine.*

Ellen Aura Eisen, SB (University of Michigan), SM (Massachusetts Institute of Technology), SM in Bios, SD (Harvard University); Associate Professor of Occupational Health (*Environmental Science and Physiology*).

John David Emerson, AB (University of Rochester), MS, PhD (Cornell University); Visiting Professor (*Health Policy and Management*); *Dean of the College and Professor of Mathematics and Computer Science, Middlebury College.*

Arnold Michael Epstein, BA (University of Rochester), AM (Harvard University), BMS (Dartmouth Medical School), MD (Duke University); Associate Professor in the Department of Health Policy and Management; *Associate Professor of Medicine, Harvard Medical School.*

Myron Elmer Essex, SB (University of Rhode Island), DVM, SM (Michigan State University), PhD (University of California, Davis), AM (hon.) (Harvard University); Professor of Microbiology (*Cancer Biology*).

John Stephen Evans, BSE, SM (University of Michigan), SM in EnvH, SD in EnvH (Harvard University); Associate Professor of Environmental Science (*Environmental Science and Physiology*).

Spencer Bryant Farr, BA (University of California, Berkeley), PhD (University of New Mexico); Assistant Professor of Toxicology.

James Joseph Feeney, AB (Dartmouth College), MD (Harvard University); Member of the Faculty of Public Health; *University Health Services.*

Henry Arthur Feldman, AB (Swarthmore College), AM, PhD (Harvard University); Associate Professor of Applied Mathematics (*Environmental Science and Physiology* and *Biostatistics*).

Penny Hollander Feldman, AB (Radcliffe College), AM, PhD (Harvard University); Lecturer on Political Science (*Health Policy and Management*).

Mark George Field, AB, AM, PhD, (Harvard University); Adjunct Professor (*Health Policy and Management*); *Professor of Sociology, Boston University.*

Harvey Vernon Fineberg, AB, MD, MPP, PhD (Harvard University), DHC (hon.) (University of Bordeaux); Dean of the Faculty of Public Health and Professor of Health Policy and Management.

Dianne Madelyn Finkelstein, AB (University of California, Berkeley), AM (Wayne State University), PhD (University of Michigan); Assistant Professor of Biostatistics.

Howard Stanley Frazier, PhB (University of Chicago), MD (Harvard University); Professor in the Department of Health Policy and Management; *Professor of Medicine, Harvard Medical School.*

Jeffrey Joseph Fredberg, BSME (Tufts University), SMME, ME, PhD (Massachusetts Institute of Technology); Associate Professor in the Department of Environmental Science and Physiology; *Associate Professor of Pediatrics, Harvard Medical School.*

Rose Epstein Frisch, AB (Smith College), AM (Columbia University), PhD (University of Wisconsin); Associate Professor of Population Studies (*Population Sciences*).

Vanessa Northington Gamble, BA (Hampshire College), MD, PhD (University of Pennsylvania); Adjunct Assistant Professor (*Health Policy and Management*); *Assistant Professor, University of Wisconsin.*

Jane Gardner, SB, SM (Boston College), SM in MCH, SD in MCH (Harvard University); Lecturer on Maternal and Child Health.

Constantine Achilles Gatsonis, BA (Princeton University), MS, PhD (Cornell University); Assistant Professor of Biostatistics; *Assistant Professor of Biostatistics, Harvard Medical School.*

Richard David Gelber, SB (Cornell University), SM (Stanford University), PhD (Cornell University); Associate Professor in the Department of Biostatistics; *Associate Professor of Pediatrics, Harvard Medical School.*

Rebecca Sue Gelman, AB (University of Michigan), PhD (State University of New York at Buffalo); Associate Professor of Biostatistics; *Dana-Farber Cancer Institute.*

Laurie Hollis Glimcher, AB (Radcliffe College), MD (Harvard University); Associate Professor of Immunology (*Cancer Biology*); *Associate Professor of Medicine, Harvard Medical School.*

Peter Goldman, B Eng Phys (Cornell University), AM (Harvard University), MD (The Johns Hopkins University); Professor of Health Sciences in Nutrition; *Maxwell Finland Professor of Clinical Pharmacology, Harvard Medical School.*

Steven Lawrence Gortmaker, AB (University of Michigan), SM, PhD (University of Wisconsin); Senior Lecturer on Sociology (*Behavioral Sciences*).

Lawrence Gostin, BA (State University of New York at Brockport), JD (Duke University); Adjunct Associate Professor (*Health Policy and Management*); *Executive Director, American Society of Law and Medicine.*

Michele L. Gougeon, BA (Franklin and Marshall College), MSS (Bryn Mawr Graduate School of Social Work and Social Research), SM (Harvard University); Adjunct Lecturer (*Health Policy and Management*); *Assistant Director for Management Information Systems, McLean Hospital, Belmont, MA.*

John David Graham, AB (Wake Forest University), AM (Duke University), PhD (Carnegie-Mellon University); Associate Professor of Policy and Decision Sciences (*Health Policy and Management*).

Robert James Gray, AB (Whitman College), SM, PhD (Oregon State University); Assistant Professor of Biostatistics; *Dana-Farber Cancer Institute.*

Robert Arthur Greenes, AB (University of Michigan), MD, PhD (Harvard University); Associate Professor in the Department of Biostatistics; *Associate Professor of Radiology, Harvard Medical School.*

Sheldon Greenfield, AB (Harvard University), MD (University of Cincinnati); Adjunct Professor (*Health Policy and Management*); *Professor of Medicine, Tufts University.*

Bernard Guyer, BA (Antioch College), MD (University of Rochester), MPH (Harvard University); Associate Professor of Maternal and Child Health.

Tamara Karn Hareven, AB (Hebrew University), AM (Cincinnati University), PhD (Ohio State University); Adjunct Professor of Population Studies (*Population Sciences*); *Professor, University of Delaware.*

Donald Alfred Harn, Jr., AB, AM (University of Northern Colorado), PhD (University of California, Los Angeles); Associate Professor of Tropical Public Health; *Assistant Professor of Medicine, Harvard Medical School.*

David Paul Harrington, AB (Tufts University), AM, PhD (University of Maryland); Associate Professor of Biostatistics; *Dana-Farber Cancer Institute.*

Joseph John Harrington, BCE (Manhattan College), AM, PhD (Harvard University); Professor of Environmental Health Engineering (*Environmental Science and Physiology* and *Population Sciences*) in the Faculty of Public Health; *Gordon McKay Professor of Environmental Engineering in the Faculty of Arts and Sciences.*

William Alan Haseltine, AB (University of California), PhD (Harvard University); Professor in the Department of Cancer Biology; *Professor of Pathology, Harvard Medical School.*

John Hedley-Whyte, BA, MB, BChir, MA, MD (Cambridge University); Professor in the Department of Health Policy and Management; *David S. Sheridan Professor of Anaesthesia and Respiratory Therapy, Harvard Medical School.*

David Hemenway, AB (Harvard University), AM (University of Michigan), PhD (Harvard University); Lecturer on Political Economy (*Health Policy and Management*).

Albert Edwin Henn, SB (Michigan State University), MD (Wayne State University), MPH (Harvard University); Lecturer on International Health (*Population Sciences* and *Health Policy and Management*); *Associate Director for Health Programs, Harvard Institute for International Development.*

Manuel Guillermo Herrera-Acena, AB, MD (Harvard University); Lecturer on Nutrition (*Population Sciences* and *Nutrition*); *Research Associate, Harvard Institute for International Development.*

Regina Elbinger Herzlinger, SB (Massachusetts Institute of Technology), DBA (Harvard University); Professor in the Department of Health Policy and Management; *Nancy R. McPherson Professor of Business Administration, Harvard Business School.*

Howard Haym Hiatt, MD (Harvard University), ScD (hon.) (Northeastern University); Professor of Medicine in the Faculty of Medicine and the Faculty of Public Health (*Health Policy and Management*).

Donald Frederick Hornig, SB, PhD (Harvard University); Professor of Chemistry in Public Health (*Environmental Science and Physiology*) and Director of Interdisciplinary Programs in Health.

William Ching-Lung Hsiao, AB (Ohio Wesleyan University), MPA, PhD (Harvard University); Professor of Health Systems Economics (*Health Policy and Management*); *Member of the Faculty of Harvard Business School.*

Chung-Cheng Hsieh, MPH (National Taiwan University), SM in Epi, SD (Harvard University); Assistant Professor of Epidemiology.

David John Hunter, BSm MB (University of Sydney, Australia), MPH, SD (Harvard University); Assistant Professor of Epidemiology.

Patricia Burton Jacoby, Member of the Faculty of Public Health and Assistant Dean for Development.

Leslie Ari Kalish, BA (Bucknell University), MA (Pennsylvania State University), SD (Harvard University); Assistant Professor of Biostatistics.

Nancy Morgan Kane, SB (Simmons College), MBA, DBA (Harvard University); Assistant Professor of Management (*Health Policy and Management*).

Phyllis Jean Kanki, BS (Tufts University), DVM (University of Minnesota, SD (Harvard University); Assistant Professor of Pathobiology (*Cancer Biology*).

Sherrie Hale Kaplan, BS, MPH, MSPH, MS, PhD (University of California, Los Angeles); Adjunct Assistant Professor (*Health Policy and Management*); *Adjunct Assistant Professor, University of California, Los Angeles.*

Jack Kasten, SB (Michigan State University), MPH (University of Michigan), JD (Boston College); Lecturer on Health Services Administration (*Health Policy and Management*); *Vice President, Arthur D. Little, Inc., Cambridge.*

Karl Timothy Kelsey, BA, MD (University of Minnesota), MOH (Harvard University); Assistant Professor of Occupational Medicine (*Environmental Science and Physiology*) and Assistant Professor of Radiobiology (*Cancer Biology*).

Kyungmann Kim, BS, MS (Seoul National University), PhD (University of Wisconsin); Assistant Professor of Biostatistics.

Lester Kobzik, BS, MD (Tufts University); Assistant Professor in the Department of Environmental Science and Physiology; *Assistant Professor of Pathology, Harvard Medical School.*

Petros Koutrakis, BS (University of Patras), MS, PhD (University of Paris); Assistant Professor of Environmental Sciences (*Environmental Science and Physiology*).

Andrzej Stefan Krolewski, MD, PhD (Medical Academy, Warsaw); Assistant Professor in the Department of Epidemiology; *Assistant Professor of Medicine, Harvard Medical School.*

Stephen William Lagakos, SB (Carnegie-Mellon University), MPhil, PhD (George Washington University), AM (hon.) (Harvard University); Professor of Biostatistics; *Dana-Farber Cancer Institute.*

Nan McKenzie Laird, SB (University of Georgia), PhD (Harvard University); Professor of Biostatistics.

Martin Graham Larson, AB, SM, SD in Bios (Harvard University); Associate Professor of Biostatistics and Population Sciences; *Co-Director, Biometry Unit, Robert B. Brigham Multipurpose Arthritis Center.*

Philip William Lavori, MS, PhD (Cornell University); Associate Professor in the Department of Biostatistics; *Associate Professor of Psychiatry, Harvard Medical School.*

Alexander Leaf, SB (University of Washington), MD (University of Michigan), AM (Harvard University); Member of the Faculty of Public Health; *Ridley Watts Professor of Preventive Medicine and Clinical Epidemiology, Harvard Medical School.*

Lucien L. Leape, AB (Cornell University), MD (Harvard University); Adjunct Professor (*Health Policy and Management*); *Professor of Surgery, Tufts University School of Medicine.*

Tun-Hou Lee, BPH (National Taiwan University), SM, SD (Harvard University); Assistant Professor of Virology (*Cancer Biology*).

Myrto Lefkopoulou, BA (University of Thessaloniki), MS (Rutgers University), SD (Harvard University); Assistant Professor of Biostatistics.

Richard Levins, AB (Cornell University), PhD (Columbia University), AM (hon.) (Harvard University); John Rock Professor of Population Sciences.

Richard Charles Lewontin, AB (Harvard University), AM, PhD (Columbia University); Member of the Faculty of Public Health (*Population Sciences*); *Alexander Agassiz Professor of Zoology, Harvard University.*

Howard Lewis Liber, SB, PhD (Massachusetts Institute of Technology); Assistant Professor of Radiobiology (*Cancer Biology*).

John Harold Lichten, BA (Oberlin College), MSW (Boston College); Member of the Faculty of Public Health and Assistant Dean for Administration.

Ellice Silver Lieberman, BA (Temple University), BHL (Gratz College), MD (University of Florida), MPH, DrPH (Harvard University); Assistant Professor of Maternal and Child Health.

John Bertram Little, AB (Harvard University), MD (Boston University); James Stevens Simmons Professor of Radiobiology (*Cancer Biology*) and Director of the Kresge Center for Environmental Health.

Stephen Hathaway Loring, AB (Amherst College), BMS (Dartmouth Medical School), MD (Harvard University); Associate Professor of Physiology (*Environmental Science and Physiology*).

Bernard Lown, SB (University of Maine), MD (The Johns Hopkins University), SD (hon.) (State University of New York at Syracuse), SD (hon.) (Bowdoin College), LHD (hon.) (Thomas Jefferson University); Professor of Cardiology in Nutrition.

Kenneth Malcolm Maclure, BA (Oxford University), SM in Epid, SD (Harvard University); Assistant Professor of Epidemiology.

James Harvey Maguire, AB (Princeton University), MD, MPH (Harvard University); Assistant Professor in the Department of Tropical Public Health; *Assistant Professor of Medicine, Harvard Medical School.*

Cyrus Rustam Mehta, BTech (Indian Institute of Technology), SM, PhD (Massachusetts Institute of Technology); Adjunct Associate Professor of Biostatistics; *Dana-Farber Cancer Institute.*

Charles Marie Joseph Mertens de Wilmars, MD, Lic en Psych (Catholic University of Louvain, Belgium); Adjunct Professor of Psychiatry (*Behavioral Sciences*); *Professor of Medical Psychology Emeritus, Catholic University of Louvain, Belgium.*

Dade William Moeller, SB, SM (Georgia Institute of Technology), PhD (North Carolina State College), AM (hon.) (Harvard University); Professor of Engineering in Environmental Health (*Environmental Science and Physiology*) and Associate Dean for Continuing Education.

Richard Francis Mollica, BA (Reed College), MD (University of New Mexico), MAR (Yale University); Assistant Professor in the Department of Health Policy and Management; *Assistant Professor of Psychiatry, Harvard Medical School.*

Richard Redding Monson, SB (North Dakota State University), MD, SM in Hyg, SD in Hyg (Harvard University); Professor of Epidemiology (*Environmental Science and Physiology* and *Epidemiology*) and Director of the Educational Resource Center for Occupational Safety and Health.

George Boswell Moseley III, BS (Ohio State University), MBA (Harvard University), JD (University of Michigan); Adjunct Lecturer (*Health Policy and Management*); *Instructor, University Seminar Center.*

Benjamin Watson Moulton, BA, PhD (Harvard University), JD (Georgetown University); Adjunct Lecturer on Health Law (*Health Policy and Management*); *Partner, Powers & Hall, Boston, MA.*

Nancy Elsa Mueller, AB (Beloit College), SM in Epid, SD in Epid (Harvard University); Associate Professor of Epidemiology.

Albert George Mulley, Jr., AB (Dartmouth College), MD, MPP (Harvard University); Assistant Professor in the Department of Health Policy and Management; *Assistant Professor of Medicine, Harvard Medical School.*

James Ivan Mullins, AB (University of South Florida), PhD (University of Minnesota); Associate Professor of Virology (*Cancer Biology*).

Jane M. Murphy, AB (Phillips University), PhD (Cornell University); Lecturer on Epidemiology; *Associate Professor of Anthropology, Harvard Medical School.*

Joseph Paul Newhouse, AB, PhD (Harvard University); John D. MacArthur Professor of Health Policy and Management in the Faculty of Medicine, the John F. Kennedy School of Government, and the Faculty of Public Health (*Health Policy and Management*) and Director of the Division of Health Policy Research and Education.

Peter Ofner, BSc (University of London), ARIC (Associate of Royal Institute of Chemistry of Great Britain and Northern Ireland), PhD (University of London); Adjunct Lecturer on Toxicology; *Director, Steroid Biochemistry Laboratory, Shattuck Hospital.*

Ann Rosenthal Oliver, AB (Smith College), EdM (Harvard University), MPH (University of Hawaii); Member of the Faculty of Public Health and Associate Dean for Academic Administration.

Endel John Orav, AB (Princeton University), PhD (Stanford University); Assistant Professor of Biostatistics.

Ralph Seal Paffenbarger, AB (Ohio State University), MD (Northwestern University), DrPH (The Johns Hopkins University); Adjunct Professor of Epidemiology; *Professor of Epidemiology, Stanford University.*

Marcello Pagano, BSc (University of Cape Town), SM (University of Florida), PhD (The Johns Hopkins University), AM (hon.) (Harvard University); Professor of Statistical Computing (*Biostatistics*).

Ruth Heather Palmer, BA, MB, BCh (Cambridge University), SM in Hyg (Harvard University); Lecturer on Health Services (*Health Policy and Management*) and Associate Dean for Students.

Steve Chia-Tung Pan, BS (Tokyo Jikeikai Premedical College), MD (Tokyo Jikeikai Medical College), MPH (Harvard University); Professor of Tropical Public Health.

Debra Ann Peattie, AB (Hollins College), PhD (Harvard University); Assistant Professor of Tropical Public Health.

Norman Henry Peterson, Member of the Faculty of Public Health and Assistant Dean for Administrative Services.

Chester Middlebrook Pierce, AB, MD (Harvard University); Professor in the Department of Behavioral Sciences; *Professor of Education and Psychiatry in the Faculty of Medicine and the Graduate School of Education.*

Willy Frans Piessens, BS (College te en van Melle, Belgium), MD (Free University of Brussels), AM (hon.) (Harvard University); Professor of Tropical Public Health; *Associate Professor of Medicine, Harvard Medical School.*

Joseph Shalom Pliskin, BSc (Hebrew University of Jerusalem), SM, PhD (Harvard University); Visiting Professor (*Health Policy and Management*); *Professor, Ben-Gurion University of the Negev, Israel.*

Peter Elliot Politser, BMS, MD (Northwestern University), AM, AM, PhD (University of Michigan); Associate Professor of Health Decision Sciences (*Health Policy and Management* and *Biostatistics*).

Vulimiri Ramalingaswami, MBBS, MD (Andhra University), DPhil, DSc (Oxford University); Adjunct Professor of International Health Science Policy (*Population Sciences*); *Retired Director-General, Indian Council for Medical Research.*

Michael Robin Reich, AB, AM, PhD (Yale University); Associate Professor of International Health (*Population Sciences* and *Health Policy and Management*) and Director of the Takemi Program in International Health.

Michael Baron Reid, BS (University of Texas, Arlington), PhD (University of Texas Health Science Center at Dallas); Assistant Professor of Physiology (*Environmental Science and Physiology*).

Vernon Nye Reinhold, SB, SM (University of New Hampshire), PhD (University of Vermont); Lecturer on Biological Chemistry (*Nutrition*); *Lecturer on Biological Chemistry, Harvard Medical School.*

Jose Marcos Chaves Ribeiro, MD (State University of Rio de Janeiro), PhD (Biophysics Institute, Rio de Janeiro); Associate Professor of Tropical Public Health.

Marc Jeffrey Roberts, AB, PhD (Harvard University); Professor of Political Economy (*Health Policy and Management*).

James Matthew Robins, MD (Washington University); Associate Professor of Occupational Health and Biostatistics (*Environmental Science and Physiology* and *Biostatistics*).

Andrea Gloria Rotnitzky, Lic., Mathematics (University of Buenos Aires), MA, PhD (University of California, Berkeley); Assistant Professor of Biostatistics.

Stephen Norman Rudnick, BS (Worcester Polytechnic Institute), MS (University of Pennsylvania), SM, SD (Harvard University); Lecturer (*Environmental Science and Physiology*).

Louise Marie Ryan, AB (Macquarie University), PhD (Harvard University); Assistant Professor of Biostatistics; *Dana-Farber Cancer Institute.*

Peter Barry Ryan, SB (University of Massachusetts), SM (University of Chicago), PhD (Wesleyan University); Assistant Professor of Environmental Health (*Environmental Science and Physiology*).

Benjamin Paul Sachs, MB, BS, MRCS, LRCP (St. Mary's Medical School, London University), DPH (University of Toronto); Associate Professor in the Department of Maternal and Child Health; *Associate Professor of Obstetrics and Gynecology, Harvard Medical School.*

Hilton Aaron Salhanick, AB, AM, PhD (Harvard University), MD (University of Utah); Frederick Lee Hisaw Professor of Reproductive Physiology (*Population Sciences*); *Professor of Obstetrics and Gynecology, Harvard Medical School.*

Leona Dorothy Samson, BS (University of Aberdeen), PhD (University of London); Associate Professor of Toxicology.

Alice Marie Sapienza, SB (Stonehill College), AM (Boston College), MBA, DBA (Harvard University); Assistant Professor of Management (*Health Policy and Management*).

Robert Schlegel, BA (University of Wisconsin), MPH, PhD (University of California, Berkeley); Assistant Professor of Toxicology.

David Alan Schoenfeld, AB (Reed College), AM, PhD (University of Oregon); Associate Professor in the Department of Biostatistics; *Associate Professor of Biostatistics, Harvard Medical School.*

Jacob Shapiro, SB (City College of New York), SM (Brown University), PhD (University of Rochester); Lecturer on Biophysics in Environmental Health (*Environmental Science and Physiology*); *Radiological Health and Safety Engineer to the University Health Services.*

Donald Sloane Shepard, AB, MPP, PhD (Harvard University); Associate Professor of Operations Management and Operations Research (*Population Sciences* and *Health Policy and Management*); *Research Associate, Harvard Institute for International Development and Director of Economic Research, West Roxbury Veteran's Administration Medical Center.*

Robert Jeremy Sherwood, BSc (Imperial College of Science and Technology), C.Eng (Royal Naval Engineering College), SM (Harvard University); Senior Lecturer on Industrial Hygiene (*Environmental Science and Physiology*).

Charles Bix Shoemaker, BS (University of New Hampshire), PhD (University of Iowa); Assistant Professor of Tropical Public Health.

Stephanie Ann Shore, BSc, PhD (McGill University); Assistant Professor of Physiology (*Environmental Science and Physiology*).

Richard Bolton Siegrist, Jr., BA (Williams College), MS (New York University), MBA (Harvard University); Adjunct Lecturer on Management (*Health Policy and Management*); *Vice President and Chief Financial Officer of Transition Systems, Inc.*

Laurel Alison Beckett Smith, BA (Pomona College), MS, PhD (Stanford University); Assistant Professor in the Department of Biostatistics; *Assistant Professor of Medicine, Harvard Medical School.*

Stover Hoffman Snook, AB (Hartwick College), AM (Fordham University), PhD (Tufts University); Lecturer on Ergonomics (*Environmental Science and Physiology*); *Project Director, Liberty Mutual Insurance Company.*

Frank Erwin Speizer, AB, MD (Stanford University); Professor of Environmental Science (*Environmental Science and Physiology*); *Professor of Medicine, Harvard Medical School.*

John Daniel Spengler, SB (University of Notre Dame), PhD (State University of New York at Albany), SM in EnvH (Harvard University); Professor of Environmental Health (*Environmental Science and Physiology*).

Andrew Spielman, SB (Colorado College), SD (The Johns Hopkins University); Professor of Tropical Public Health.

Meir Jonathan Stampfer, AB (Columbia University), MD (New York University), MPH, DrPH (Harvard University); Associate Professor of Epidemiology.

Judith Storch, AB (Brooklyn College), SM, PhD (Columbia University); Assistant Professor of Nutrition.

Deirdre Strachan, AB (Mount Holyoke College), MSW (Boston University), MPH, SD (Harvard University); Adjunct Lecturer on Family Planning (*Population Sciences*); *Director, Department of Technical Services and Planning, The Pathfinder Fund.*

Hei Sook Sul, BS (Ewha University, Korea), SM, PhD (University of Wisconsin); Assistant Professor of Biochemistry (*Nutrition*).

Armen Haig Tashjian, Jr., MD (Harvard University); Professor of Toxicology; *Professor of Biological Chemistry and Molecular Pharmacology, Harvard Medical School.*

Marcia Anne Testa, BA (Connecticut College), MPH, MPhil, PhD (Yale University); Lecturer on Biostatistics.

Kenneth Earl Thorpe, BA (University of Michigan), MA (Duke University), PhD (Rand Graduate Institute); Assistant Professor of Economics (*Health Policy and Management*).

Richard Graeme Titus, BS (Northern Arizona University), MS, PhD (University of Washington); Assistant Professor of Tropical Public Health; *Assistant Professor of Medicine, Harvard Medical School.*

William Augustine Toscano, SB, SM (Indiana University), PhD (University of Illinois); Associate Professor of Toxicology.

Ze'ev Trainin, DVM (University of Bern, Switzerland); Visiting Professor of Immunology (*Cancer Biology*); *Professor and Head, Department of Immunology, Kimron Veterinary Institute, Israel.*

Dimitrios Vassiliou Trichopoulos, Diploma in Medicine, MD (University of Athens), SM in Hyg (Harvard University); Professor of Epidemiology.

Anastasios Athanasios Tsiatis, SB (Massachusetts Institute of Technology), PhD (University of California, Berkeley); Associate Professor of Biostatistics; *Dana-Farber Cancer Institute.*

Ming Tso Tsuang, MD (National Taiwan University), PhD, DSc (hon.) (University of London), AM (hon.) (Brown University); Professor in the Department of Epidemiology; *Professor of Psychiatry, Harvard Medical School.*

Isabelle Valadian, MD (Faculte Française de Medicine, Beirut, Lebanon), MPH (Harvard University); Professor of Maternal and Child Health.

Peter Alexander Valberg, AB (Taylor University), AM, SM, PhD (Harvard University); Associate Professor of Physiology (*Environmental Science and Physiology*).

Hannelore Falk Vanderschmidt, BA (Wellesley College), EdM (Harvard University), PhD (Boston College); Adjunct Lecturer in the Faculty of Public Health (*Health Policy and Management*); *Co-Director, Center for Educational Development in Health, Boston University.*

Alexander Muir Walker, AB, MD, MPH, DrPH (Harvard University); Associate Professor of Epidemiology.

Deborah Klein Walker, AB (Mount Holyoke College), EdM, EdD (Harvard University); Lecturer on Human Development (*Behavioral Sciences* and *Maternal and Child Health*) (on leave 1989–90).

James Hutchinson Ware, AB (Yale University), PhD (Stanford University), AM (hon.) (Harvard University); Professor of Biostatistics.

Angeline Elnora Warner, BA (Vassar College), MS (University of Miami), DVM (University of Florida), SD (Harvard University); Assistant Professor of Environmental Science and Physiology.

Christine Waternaux, AM (Faculte de Sciences Economiques de l'Universite de Paris), PhD (Yale University); Assistant Professor in the Department of Biostatistics; *Assistant Professor of Biostatistics, Harvard Medical School.*

Henry Wechsler, AB (Washington and Jefferson College), AM, PhD (Harvard University); Lecturer on Social Psychology (*Behavioral Sciences*); *Research Director, The Medical Foundation, Inc.*

Milton Charles Weinstein, AB, AM, MPP, PhD (Harvard University); Henry J. Kaiser Professor of Health Policy and Management (*Health Policy and Management* and *Biostatistics*).

Walter Churchill Willett, MD (University of Michigan), MPH, DrPH (Harvard University); Professor of Epidemiology and Nutrition (*Epidemiology* and *Nutrition*).

Dyann Fergus Wirth, AB (University of Wisconsin at Madison), PhD (Massachusetts Institute of Technology); Associate Professor of Tropical Public Health.

Paul Wise, AB, MD (Cornell University), MPH (Harvard University); Assistant Professor in the Department of Maternal and Child Health; *Assistant Professor of Pediatrics, Harvard Medical School.*

Jelia Cox Witschi, SB (West Virginia University), SM (Case Western University); Lecturer on Nutrition.

Martin J. Wohl, AB (Harvard University), MD (Columbia University); Member of the Faculty of Public Health; *Director of the Medical Area Health Services.*

David Wypij, BS, MS (Clarkson University), ScM (Brown University), PhD (Cornell University); Assistant Professor of Biostatistics.

Yukio Yanagisawa, BEng, MEng, DEng (University of Tokyo); Assistant Professor of Environmental Health (*Environmental Science and Physiology*).

Marvin Zelen, SB (City College of New York), AM (University of North Carolina), PhD (American University), AM (hon.) (Harvard University); Professor of Statistical Science (*Biostatistics*); *Member of the Faculty of Arts and Sciences; Director of Statistics Unit, Dana-Farber Cancer Institute.*

PROFESSORS EMERITI

David Elliott Bell, AB, AM, LLD (hon.), Clarence James Gamble Professor of Population Sciences and International Health, Emeritus (1988).

Paul Maximillian Densen, AB, SD, AM (hon.), Professor of Community Health, Emeritus (1980).

Benjamin Greeley Ferris, Jr., AB, MD, DHC (hon.), Professor of Environmental Health and Safety, Emeritus (1989).

Melvin William First, SB, SM, SD, Professor of Environmental Health Engineering, Emeritus (1985).

Robert Pershing Geyer, SB, SM, PhD, Professor of Nutrition, Emeritus (1987).

Roy Orval Greep, SB, SM, PhD, AM (hon.), SD (hon.), John Rock Professor of Population Studies, Emeritus (1974).

David Mark Hegsted, SB, SM, PhD, AM (hon.), Professor of Nutrition, Emeritus (1980).

George Barkley Hutchison, AB, MD, MPH, Professor of Epidemiology, Emeritus (1988).

Nathan Keyfitz, BSc, PhD, Andelot Professor of Sociology in the Faculty of Arts and Sciences and of Demography in the Faculty of Public Health, Emeritus (1983).

Alexander Hamilton Leighton, AB, AM, MD, AM (hon.), Professor of Social Psychiatry, Emeritus (1975).

Brian MacMahon, MB, ChB, MD, DPH, PhD, SM, MD (hon.), DSc (hon.), Henry Pickering Walcott Professor of Epidemiology, Emeritus (1989).

Jere Mead, SB, MD, Cecil K. and Philip Drinker Professor of Environmental Physiology, Emeritus (1987).

C. Frederick Mosteller, SB, SM, AM, PhD, SD (hon.), SD (hon.), SD (hon.), SSD (hon.), Roger Irving Lee Professor of Mathematical Statistics, Emeritus (1987).

Roger Randall Dougan Revelle, AB, PhD, SD (hon.), AM (hon.), LHD, LLD, Richard Saltonstall Professor of Population Policy, Emeritus (1978).

Elizabeth Prince Rice, AB, SM, Associate Professor of Public Health and Social Work, Emerita (1967).

Julius Benjamin Richmond, SB, SM, MD, Professor of Health Policy, Emeritus (1988).

William Morris Schmidt, SB, MD, AM (hon.), Professor of Maternal and Child Health, Emeritus (1973).

John Crayton Snyder, AB, MD, LLD, Professor of Population and Public Health, Emeritus (1976).

Fredrick John Stare, SB, SM, PhD, MD, AM (hon.), SD (hon.), DSc (hon.), Professor of Nutrition, Emeritus (1980).

Thomas Huckle Weller, AB, SM, MD, LLD (hon.), Richard Pearson Strong Professor of Tropical Public Health, Emeritus (1985).

James Laverre Whittenberger, SB, MD, AM (hon.), James Stevens Simmons Professor of Public Health; Professor of Physiology, Emeritus (1982).

Jane Worcester, AB, DrPH, SD (hon.), Professor of Biostatistics and Epidemiology, Emerita (1977).

Alonzo Smythe Yerby, SB, MD, MPH, Professor of Health Services Administration, Emeritus (1982).

Admissions Office
Harvard School of
Public Health
677 Huntington Avenue
Boston, MA 02115

Second Class
Postage paid at
Boston, MA

Official Register of
Harvard University
(ISSN 0199-1787)